THE WHITMAN COMPANIES, INC.

Setting the Standard in Environmental Engineering & Management

307294

SECOND AMENDED TECHNICAL MEMORANDUM FOR DEVELOPMENT AND SCREENING OF ALTERNATIVES FOR SITE REMEDIATION

FOR

ROCKAWAY BOROUGH WELL FIELD SITE
OPERABLE UNIT #3
FOR PROPERTY OF
KLOCKNER & KLOCKNER
ROCKAWAY BOROUGH, NEW JERSEY

SUBMITTED TO
USEPA-REGION II
EMERGENCY & REMEDIAL RESPONSE DIVISION
NEW YORK, NEW YORK

SUBMITTED BY
THE WHITMAN COMPANIES, INC.
ON BEHALF OF KLOCKNER & KLOCKNER

IN ACCORDANCE WITH
ADMINISTRATIVE ORDER ON CONSENT
INDEX NO. II-CERCLA-95-0104

OCTOBER 2005

MICHAEL N. METLITZ
PROJECT MANAGER

IRA L. WHITMAN, PH.D., P.E.
PRINCIPAL CONSULTANT

116 Tices Lane, Unit B-1, East Brunswick, NJ 08816
www.whitmanco.com

THE
WHITMAN
COMPANIES, INC.

Corporate Headquarters
116 Tices Lane, Unit B-1
East Brunswick, NJ 08816

Tel: 732.390.5858 • Fax: 732.390.9496
Email: whitman@whitmanco.com
Internet: www.whitmanco.com

October 14, 2005

Chief, New Jersey Superfund Branch I
Emergency & Remedial Response Division
U.S. Environmental Protection Agency, Region II
290 Broadway, Floor 19
New York, NY 10007

Attn: Brian Quinn, Project Manager

RE: Second Amended Technical Memorandum
Klockner & Klockner
Rockaway Borough Wellfield Superfund Site
Administrative Order on Consent ("AOC")
Index No. II-CERCLA-95-0104
Whitman Project #95-03-02

Dear Mr. Quinn:

In compliance with Paragraph 34 of the above AOC, Task VIII of the Statement of Work and the U.S. Environmental Protection Agency's (EPA's) September 14, 2005 comments concerning Klockner and Klockner's March 3, 2005 First Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation for the above referenced site, enclosed are four copies of the Second Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation (Technical Memorandum). The Technical Memorandum incorporates EPA's September 14, 2005 comments and the July25, 2005 New Jersey Department of Environmental Protection's comments which were included with EPA's comment letter.

If you have any questions or comments concerning the Technical Memorandum, please contact me at (732) 390-5858.

Very truly yours,

Michael N. Metlitz
Senior Project Manager

MNM/
Enclosure
cc: Frances Zizila, Assistant Regional Counsel, EPA
Dan Klockner, Klockner & Klockner
Jennifer Peterson, Esq., Riker Danzig, Scherer, Hyland & Perretti
Donna Gaffigan, NJDEP

307295

SECOND AMENDED TECHNICAL MEMORANDUM FOR DEVELOPMENT AND SCREENING OF ALTERNATIVES FOR SITE REMEDIATION ROCKAWAY BOROUGH WELL FIELD SITE OPERABLE UNIT #3 FOR PROPERTY OF KLOCKNER & KLOCKNER ROCKAWAY BOROUGH, NEW JERSEY

Table of Contents

TABLES

FIGURES

ATTACHMENTS

SECOND AMENDED TECHNICAL MEMORANDUM FOR DEVELOPMENT AND SCREENING OF ALTERNATIVES FOR SITE REMEDIATION ROCKAWAY BOROUGH WELL FIELD SITE OPERABLE UNIT #3 FOR PROPERTY OF KLOCKNER & KLOCKNER ROCKAWAY BOROUGH, NEW JERSEY

1.0 INTRODUCTION

This Second Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation (TMDSASR) has been prepared by The Whitman Companies, Inc. (Whitman) on behalf of Klockner & Klockner (Klockner) in accordance with Chapter VIII, Paragraph 34 of the Administrative Order on Consent (AOC) entered into by Klockner and the United States Environmental Protection Agency (EPA), and Task VIII of the Statement of Work (SOW) (USEPA, 1995). This Second Amended TMDSASR incorporates EPA's September 14, 2005 comments (Attachment 1) on Klockner's March 3, 2005 First Amended TMDSASR.

1.1 Purpose of Report

The purpose of this Second Amended TMDSASR is to:

- Describe the process employed in the development of the remedial action objectives and screening of general response actions, remedial technologies and process options for the Rockaway Borough Wellfield Site (Site) - Operable Unit #3 at Block 5, Lots 1 and 6, and Block 7, Lots 7 and 8, in the Borough of Rockaway (Klockner Property). Operable Unit #3 consists of the soil component of the response activities associated with source areas contributing to ground water contamination at the Site.

- Identify and screen the general response actions, remedial technologies and process options available for the development of remedial alternatives for soil contamination, due to the presence of Trichloroethylene (TCE) and Tetrachloroethylene (PCE) and Lead.

- Identify remedial technologies and process options to retain for the development of remedial alternatives for soil contamination based on effectiveness, implementability and cost.

- Assemble remedial alternatives from the retained remedial technologies for use in the Feasibility Study for the contaminated soils at Operable Unit #3.

307300

1.2 Report Organization

The Second Amended TMDSASR is organized as follows:

- Section 1 - Introduction
- Section 2 – Site background
- Section 3 – CERCLA criteria used to evaluate remediation alternatives
- Section 4 – Development of Remedial Action Objectives
- Section 5 – Development and screening of remedial technologies and process options
- Section 6 – Development of remedial alternatives
- Section 7 – Conclusions
- Section 8 – References

2.0 SITE BACKGROUND

2.1 Klockner Property Location

The Klockner Property is located at the intersection of Stickle Avenue and Elm Street in the north end of the Borough of Rockaway in Morris County, New Jersey. The Klockner Property is a portion of the Rockaway Borough Well Field Site (Site), which itself encompasses approximately 2.1 square miles. The Rockaway Borough well field is located approximately 600 feet southwest of the Klockner Property. See Figure 1 for the Klockner Property location on a U.S.G.S. Dover, N.J. quadrangle. A site map of the Klockner Property is included as Figure 2.

The Klockner Property consists of two separate properties. The first property is located north of Stickle Avenue and is currently owned by Klockner. This portion of the Klockner Property consists of Block 5, Lots 1 and 6, and is referred to as the "Building 12 Property."

The second portion of the Klockner Property is located south of Stickle Avenue and consists of Block 7, Lots 7 and 8, and is referred to as the "Building 13 Property." Lot 7 is currently owned by Norman Iverson and operated by F.G. Clover Co. Lot 8 is currently owned by Klockner and is used as parking for Building 12 Property tenants.

The Building 12 Property consists of 1.34 acres. The majority (approximately 93%) of the Building 12 Property is covered by building structures and pavement. The building structures consist of approximately 50,000 square feet of one and two story space used for manufacturing, office space and storage. The Building 12 Property is bordered to the south by Stickle Avenue, to the east by Oak Street and residential housing, to the north by Ford Road and to the west by Elm Street.

Lot 7 of the Building 13 Property consists of approximately 1.07 acres, and Lot 8 consists of approximately 0.5 acres. There are two building structures present on Lot 7 of the Building 13 Property. The building coverage of the Building 13 Property is approximately 12,400 square feet. Approximately 50% of the Building 13 Property is covered by building structures and pavement. Lot 8 is a partially paved area with no structures. The Building 13 Property is bordered to the north by Stickle Avenue, to the west by Elm Street, to the south by residential property and to the east by a railroad line.

2.2 Site History

The Site is a municipal well field that serves approximately 10,000 people. The Rockaway Borough's three water supply wells (#1, 5 and 6) draw water from an unconsolidated glacial aquifer from a depth ranging from 54 to 84 feet below grade. The supply wells are located off of Union Street and are southwest of the Klockner Property.

Contamination of the groundwater at the Site was first discovered in 1979. The primary contaminants identified were Trichloroethylene (TCE) and Tetrachloroethylene (PCE). Several inorganic contaminants, including Chromium, Lead and Nickel, also were identified. The Site was placed on the EPA's National Priorities List of Superfund sites in December 1982.

Following discovery of ground water contamination at the Site, the New Jersey Department of Environmental Protection (NJDEP) conducted an RI/FS (SAIC, 1986), which was known as Operable Unit 1 (OU1), and EPA conducted a second RI/FS (ICF, 1991a and b), which was known as Operable Unit 2 (OU2). Through these studies, the Klockner Property was identified as one of the potential source areas of the Site contamination and was designated as the Operable Unit #3 by EPA.

The investigation of soil and ground water contamination was initiated at the Building 12 portion of the Klockner Property in 1986 under New Jersey's Environmental Cleanup Responsibility Act (ECRA). The ECRA investigation was conducted under oversight of the NJDEP. Soil and ground water contamination were detected, consisting primarily of chlorinated volatile organic compounds. Klockner withdrew from the ECRA program in 1990 but continued to investigate the source of TCE and PCE contamination in soil through January 1992.

The remediation of the contamination originating from the Klockner Property area already in the ground water and saturated zone is being addressed by Alliant Techsystems Inc. (previously

307302

Thiokol Corp. then Cordant Technologies, Inc.) pursuant to a 1994 Consent Decree entered into between Thiokol and EPA. Under the 1995 AOC and SOW, Klockner agreed to conduct an RI/FS addressing the source(s) of the ground water contamination present in the unsaturated zone at the Klockner Property. The unsaturated zone was identified as the area above the water table as defined by the lowest water level measurements in the Site monitoring wells on or before January 16, 1991 (Attachment 2). The lowest water level measurements are identified on Figures A1, A2 and A3 in Attachment 2. The remedial investigation activities conducted at the Klockner Property by Klockner were reported in the May 2004 Final Remedial Investigation Report.

2.3 Development and Screening of Alternatives for Site Remediation

The development and screening of alternatives for site remediation is conducted in accordance with the requirements of the EPA document Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA.

3.0 CERCLA CRITERIA USED TO EVALUATE REMEDIATION ALTERNATIVES

The nine evaluation criteria employed for the selection of the remedial alternatives include:

Category	Criteria
Threshold Criteria	1. To provide protection of human health and the environment 2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
Balancing Criteria	3. Offer Long term effectiveness 4. Evaluation of how the remedy acts to reduce the toxicity, mobility, and volume of the contamination 5. Short term effectiveness 6. Implementability 7. Cost Effectiveness
Regulatory Agency and Community Criteria	8. Assessment of state acceptance 9. Community acceptance

4.0 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

4.1 Cleanup Criteria for TCE, PCE and Lead

Soil is the only media being evaluated under this Second Amended TMDSASR. The soil contaminants of concern and proposed cleanup criteria are presented below.

307303

4.1.1 Contaminants of Concern Identified on Subject Site

The contaminants of concern identified in the soil at the Klockner Property include:

- Trichloroethylene (TCE)
- Perchloroethylene (PCE)
- Lead

The highest concentration of Lead detected in soil was of 841 mg/kg at a depth of 0-0.5 feet. The highest concentration of TCE detected in soil was 90 mg/Kg at a depth of 1-1.5 feet. The highest concentration of PCE detected in soil was 23.7 mg/Kg at a depth of 2-2.5 feet in the Quonset Hut location of the Klockner Property.

4.1.2 Remedial Action Objectives

The following provides information concerning the nature and extent of contamination, Applicable or Relevant and Appropriate Requirements (ARARs), and EPA and New Jersey State cleanup criteria/standards. The Remedial Action Objectives (RAOs) for the Klockner Property are then developed based on this information.

The Risk Assessment conducted by EPA and included in the May 2004 Final Remedial Investigation Report indicated that the Lead, TCE and PCE concentrations present in the soils at the Klockner Property were not a concern with respect to the current property use. The summary section of the EPA's Risk Assessment is provided below:

The results of the hazard and risk calculations for the Klockner and Klockner property indicate that the current noncancer hazards and cancer risks for an adult worker and adolescent intermittent visitor from soil exposure are below or within EPA's acceptable values. This assessment only accounted for the hazards and risks associated with soil exposure, so the actual risk at the site may be higher when other contaminated medium are included. The potential future uses of the site as a recreational park visitor yielded hazards and risks for an adult and child population for soil exposure that were below or within EPA's acceptable values. Another potential, although unlikely, future use as a residential area indicated that the hazards and risks for an adult resident were below or within EPA's acceptable values. However, the noncancer hazard for a child resident, driven by trichloroethene and iron, exceeded EPA's acceptable value. The concentrations of trichloroethene and tetrachloroethene detected in the soil exceed New Jersey's criteria for soil contamination due to potential to contaminate groundwater. Thus, even though the hazards and risks for soil exposure are below or within acceptable EPA values, a remedial action may still be warranted.

307304

The purpose of ARARs is to ensure that response actions are consistent with other pertinent federal and state requirements for public health and environmental protection that legally would be required or applicable in sufficiently similar circumstances to those encountered at hazardous waste sites. In addition, the Superfund Amendments and Reauthorization Act (SARA) requires that state ARARs be considered during the assembly of remedial alternatives if they are more stringent than Federal requirements. EPA also has indicated that "other" criteria, advisories, and guidelines must be considered in evaluating remedial alternatives. ARARs are categorized, using current EPA practice, as contaminant-specific, location-specific, and action-specific.

A list of potential Federal and State of New Jersey ARARs for the site was analyzed and considered to determine the cleanup criteria for the Site.

NJDEP's May 12, 1999 Soil Cleanup Criteria (NJSCC) guidance document contains guidance criteria that are "to be considered" (TBC). The NJSCC include impact to ground water soil cleanup criteria (NJIGWSCC), residential direct contact soil cleanup criteria (NJRDCSCC) and nonresidential direct contact soil cleanup criteria (NJNRDCSCC). These three types of soil cleanup criteria are TBC when evaluating remedial alternatives for the Klockner Property. NJDEP requires remediation of soil contamination that exceeds the unrestricted use criteria, which is defined as the lowest of any numeric standard, without limitation, any residential soil remediation standard, any non-residential soil remediation standard and any applicable impact-to-ground water soil standard. The most predominant contaminants detected in the soil at the Klockner Property above the most stringent NJSCC included TCE, PCE and Lead as summarized below. The Proposed Cleanup Concentrations identified in Table 1 are the most stringent of the ARARs and TBC and are used to identify the RAO. For Lead, NJDEP has not published an NJIGWSCC, only NJNRDCSCC and NJRDCSCC. The Lead soil contamination is limited in extent and does not appear to be impacting ground water. Therefore, the Proposed Cleanup Concentration for Lead is its NJRDCSCC.

307305

Table 1
Relevant Cleanup Levels for Site Contaminants

Contaminant	NJIGWSCC	NJRDCSCC	Proposed Cleanup Concentration	Maximum Concentration Found
TCE	1 mg/kg	23 mg/kg, residential	1 mg/kg for impact to ground water	90 mg/kg
PCE	1 mg/kg	4 mg/kg, residential	1 mg/kg for impact to ground water	23.7 mg/kg
Lead	No Standard	400 mg/kg	400 mg/kg for residential per NJRDCSCC	841 mg/kg

Based on the above information, the RAOs identified for the Klockner Property are as follows:

1. Remediation of the Chlorinated Volatile Organic Compounds (CVOC) soil contamination to achieve the NJIGWSCC to remove the potential continuing source of ground water contamination.

2. Remediation of the Lead soil contamination to achieve the NJRDCSCC to remove direct contact exposure.

4.2 Media to Which Remedial Action Applies

Based on the 1995 AOC between EPA and Klockner & Klockner, this Second Amended TMDSASR is focused on the remedial actions that apply to soil media above the water table. The ground water remediation is being addressed by Alliant Techsystems, Inc.

4.3 Identification of Volumes or Areas of Media

Volumes and location of soil to which remedial action applies is as follows:

4.3.1 TCE and PCE Contamination

Building 12 Property:

The primary CVOC detected above its Proposed Cleanup Concentration (NJIGWSCC of 1 mg/kg) at the Building 12 Property was TCE. Except for the North Drum Storage Area, the other areas where CVOCs were detected were further investigated as part of the Alleyway Area. The sampling activities conducted have delineated the vertical and horizontal extent of the CVOC soil contamination at the Building 12 Property. The CVOC soil contamination generally extends to a depth of less than 5 to 7 feet. The TCE contaminated area exceeding the Proposed Cleanup Concentration is irregularly shaped and is approximately 215 feet across its north-south axis and varies in width from approximately 50 feet to 155 feet from east to west. The estimated quantity of soil exceeding the Proposed Cleanup Concentration for TCE is approximately 4,090 cubic yards. The approximate horizontal and vertical extent of the TCE soil contamination with respect to the Proposed Cleanup Concentration is included in Figures 3, 5 and 6.

PCE was detected in the soil samples collected at the Quonset Hut, Sump and southwestern portion of the area between the Alleyway and Degreaser Pit. Based on comparison to the TCE concentrations throughout these areas, PCE is considered a secondary contaminant. The PCE contaminated areas exceeding the Proposed Cleanup Concentration (NJIGWSCC of 1 mg/kg) are irregular in shape and are approximately 3,375 square feet by 5 feet deep (625 cubic yards) (Quonset Hut/Sump) and approximately 4,200 square feet by 5 feet deep (778 cubic yards) (Southwestern Portion). The quantitation limits (range from 1.46 to 3.07 mg/kg) for some of the samples collected in the Scale Room and the area between the Alleyway and Degreaser Pit (Samples SSSR-2, SSSR-3, SSAW-2, SSAW-3, SSAW-4, SSAW-9, SSAW-10) were just above the Proposed Cleanup Concentration. The TCE concentrations in the noted samples all exceeded 19 mg/kg, identifying the areas for remedial activities. The higher TCE concentrations resulted in the need for the laboratory to dilute the affected samples. Such a dilution resulted in the increase of the quantitation limits for PCE to above 1 mg/kg. Therefore, if the PCE was present above 1 mg/kg and less than the quantitation limit, it is highly likely that it would have been detected below the quantitation limit and reported as such. Therefore, the fact that the quantitation limits for the PCE in the affected samples were just above its Proposed Cleanup Concentration is not a concern with respect to defining the extent of PCE contamination or identifying remedial activities for the Site. The vertical and horizontal extent of the PCE affected areas has been delineated. The approximate horizontal and vertical extent of the PCE soil contamination with respect to the Proposed Cleanup Concentration is included in Figures 10, 11 and 12.

Building 13 Property:

The results of the sampling activities identified one (1) area where PCE soil contamination was detected above its Proposed Cleanup Concentration (NJIGWSCC of 1 mg/kg). This area is identified as the Fence Area. The highest PCE concentration detected in this area was 4.28 mg/kg. The PCE contamination has been delineated both horizontally and vertically (Figures 7 and 8) in this area, and covers an area of approximately 40 feet by 20 feet by less than 5 feet deep (150 cubic yards).

307307

4.3.2 Lead Contamination

Building 12 Property:

Site investigation studies show that the Lead contamination is confined to an area of 20'x 18' along the Northeast property boundary line of the Building 12 Property.

Lead contamination was detected above the Proposed Cleanup Concentration (NJRDCSCC of 400 mg/kg) at the former Drum Storage Shed Area located just northeast of the Alleyway. The sampling activities conducted have vertically and horizontally delineated the Lead concentrations below the Proposed Cleanup Concentration (Figure 9). At the most, the area of Lead concentrations exceeding the Proposed Cleanup Concentration is 20 feet by 18 feet by 2 feet deep (27 cubic yards).

5.0 DEVELOPMENT AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

5.1 Introduction

Process options are remedial technologies and/or techniques that can be used either individually or in combination to control risks to human health and the environment and satisfy the RAOs unique to each contaminated site. Remedial technologies are organized under General Response Actions (GRAs), i.e. containment, treatment, disposal. The initial list of remedial technologies and process options considered in the Final Remedial Investigation Report was developed by Klockner.

This section identifies and screens the remedial technologies and process options applicable to the soil contamination at the Klockner Property that could potentially be used to achieve the RAOs. A preliminary screening of technologies and process options was conducted based on technical implementability to eliminate infeasible or impractical options given the site-specific conditions. Those technologies that passed the initial screening were further analyzed based on effectiveness, implementability and cost as presented in Section 5.4. Section 6.0 assembles the surviving process options into remedial alternatives deemed capable of achieving the remedial action objectives.

5.2 General Response Actions

GRAs for remediation of a site may include excavation, containment, treatment, extraction, disposal, institutional actions or a combination of these. Based on the RAOs, site conditions, volumes of soil requiring remediation, and information on the remediation of CVOCs and Lead in soils, GRAs were identified for the soil contamination present at the Klockner Property.

GRAs are those actions that will satisfy the RAOs for the contaminated media at a site by reducing the concentration of contaminants of concern or reducing the potential for contact with the contaminants of concern.

The appropriate GRAs identified for addressing the soil contamination at the Klockner Property include:

- No action
- Institutional controls
- Containment
- Removal
- Treatment
- Disposal

Each of the GRAs was investigated and screened for specific remedial technologies and process options. A brief description of the GRAs is presented below.

5.2.1 No Action

Evaluation of the no action alternative is required by EPA as it provides a baseline against which impacts of other GRAs can be compared. There would be no active remediation conducted to reduce the toxicity and volume of contamination. The current contamination present at the site would continue unabated.

5.2.2 Institutional Controls

Institutional controls are designed to reduce exposure to toxic chemicals and protect human health by restricting land use. The most common institutional control is a restrictive covenant in the form of a deed notice. Institutional controls typically identify the location of the contaminants, what restrictions are present at the site, requirements for notices to current or perspective owners or tenants, maintenance requirements and monitoring. Long term monitoring would fall under this GRA. This GRA does not reduce the concentration or volume of the contaminants. Institutional controls may be appropriate when combined with other GRAs, i.e. containment.

5.2.3 Containment

Containment is designed to prevent human and environmental receptor exposure to contaminated material using physical barriers. Common containment options include capping of

307309

contaminated areas. Containment is used to isolate the contaminated media and restrict migration of contaminants. Containment does not reduce the concentration or volume of contaminants.

5.2.4 Removal

Removal involves the excavation/extraction of contaminated media from the ground. Following excavation/extraction, the area is restored. Removal is typically used in conjunction with other GRAs, i.e. disposal, to meet the RAOs for the site. This GRP does not reduce the contaminant concentration but transfers the contaminants for further remediation under another GRA.

5.2.5 Treatment

Treatment involves the destruction of contaminants, transfer of contaminants to another media or alteration of the contaminant so it is innocuous. Treatment technologies include thermal, chemical, physical and biological technologies. The treatment technologies include in-situ and ex-situ options. If feasible, the treatment GRA is usually preferred. A presumptive remedy for VOCs under appropriate conditions is soil vapor extraction.

5.2.6 Disposal

Disposal involves the transfer of contaminated media, concentrated contaminants or other related materials to a site permitted for treatment or long term storage.

5.3 Treatment Location

The following are the possible ex-situ treatment locations for excavated material.

- Building 12 parking lot
- Building 13 parking lot

5.4 Preliminary Screening of Technologies and Process Options

For each GRA there are various remedial technologies that are used to conduct the remediation. The term remedial technology refers to general categories of technology types, such as physical/chemical, capping, or excavation. Each remedial technology may have several process options, which refer to the specific material, method or equipment used to implement a technology.

307310

During this screening step, process options and entire technology types were eliminated from further consideration on the basis of technical implementability. The factors considered included compatibility with site conditions (e.g. site subsurface conditions, site physical features and chemical characteristics) and whether the technology had been proven to control the contaminants of concern. The screening criteria were applied based on site characteristics, published information, experience, and engineering judgment.

A technology or process option was rejected from further consideration if it:

- would not be a practical method for the volume or area of contaminated soil to be remediated;
- would not be an effective method for cleanup of all contaminants, either alone or in combination with another method, because of characteristics or concentrations of the contaminants present;
- would not be feasible or effective because of site conditions, such as location, size, surrounding land use, geology and soils, and characteristics of the contaminated soil;
- could not be effectively administered;
- has not been successfully demonstrated for the site contaminants or media; or
- has extremely high costs relative to other equally effective technologies or process options.

Tables 2 and 3 present the GRA, Remedial Technologies and Process Options for the CVOC and Lead soil contamination, respectively. A description of the process options is provided to assist in evaluating the option's technical implementability. The Screening Comments indicate if a process option has been rejected or is potentially applicable. Where appropriate, information on the technical feasibility of an option and its ability to serve its intended purpose is provided. The retained technologies and process options are further evaluated in Section 5.4.

307311

TABLE 2

Preliminary Screening of Technologies and Process Options for TCE and PCE Remediation

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
No Action	None	Not Applicable	No actions are taken.	Required for consideration by NCP.
Institutional Controls	Access and Use Restrictions	Deed Restrictions	Deed notice identifies presence of soil contamination, restrictions concerning contaminated area, notice requirements and maintenance requirements.	Potentially applicable.
Institutional Controls	Monitored Attenuation	Contaminant Monitoring	Attenuation of contaminant is monitored.	Rejected as the contaminants of concern will still be a threat to human health and the environment. Particularly, TCE and PCE soil contamination will continue to act as a potential source of ground water contamination.
Containment	Cap	Clay and Soil	Placement of clay overlain with soil over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Rejected as other capping materials are appropriate given the current development and use of the Klockner Property.
Containment	Cap	Asphalt	Placement of asphalt over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Cap	Concrete	Placement of concrete over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Cap	Multi Media	Placement of multi-media cap over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Subsurface Barriers	All Processes	Includes use of grouts or low permeability slurries to form impermeable subsurface barriers.	Rejected as horizontal migration of contamination is not a primary concern, the facility is an active industrial property creating difficulty for installation and there are more effective and practical methods.
Removal	Excavation	Excavation	Contaminated soil is excavated for transport.	Potentially applicable.
Treatment	On-Site Incineration	Fluidized Bed or Rotary Kiln	Contaminated soil is heated to high temperatures to volatilize and combust organic contaminants.	Rejected as it is over kill due to the relatively low concentration of TCE and PCE, facility is active and excavation of soil inside building would be disruptive, there is not sufficient area on site for treatment and method would require significant quantities of soil to be cost effective.

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
Treatment	On-Site Thermal Desorption	Heating Units	Contaminated soil is heated to low to medium temperatures to volatilize water and organic contaminants. Volatiles are collected in a gas treatment system.	Rejected as facility is active and excavation of soil inside building would be disruptive, and there is not sufficient area on site for treatment.
Treatment	Aeration	Vapor Extraction	Air is drawn through contaminated soil creating a gradient for the transport of volatiles from the soil to gas phase. Volatiles are collected in a gas treatment system.	Rejected as facility is active, excavation of soil inside building would be disruptive, and there is not sufficient area on site for treatment.
Treatment	Physical/Chemical	Soil Washing	Contaminated soil is treated in an aqueous based system that separates contaminants from the soil particles. The wash water may contain various agents to help remove organics and heavy metals.	Rejected as facility is active, excavation of soil inside building would be disruptive, and there is not sufficient area on site for treatment. Also method is geared towards heavy metals and non volatile organics.
Treatment	Physical/Chemical	Solidification/Stabilization/Fixation	Contaminated soil is treated with materials that cause the contaminants to be bound or enclosed within the treated matrix so that it can not leach out.	Rejected as facility is active, excavation of soil inside building would be disruptive, and there is not sufficient area on site for treatment. Also method is geared towards heavy metals and non volatile organics.
Treatment	Physical/Chemical	Solvent Extraction	Contaminated soil is mixed with solvent which extracts the contaminant from the soil. The solvent/extract mixture is then treated further.	Rejected as facility is active, excavation of soil inside building would be disruptive, and there is not sufficient area on site for treatment. Also method is geared towards soils contaminated with higher concentrations of CVOCs than are present at the Klockner Property.
Treatment	Biological	Aerobic or Anaerobic	Excavated soil is mixed with soil amendments and placed in an aboveground enclosure for treatment. The treatment can be done as a solid phase or as a slurry.	Rejected as facility is active, excavation of soil inside building would be disruptive, and there is not sufficient area on site for treatment. Also method is geared towards soils contaminated with higher concentrations of CVOCs than are present at the Klockner Property.
Treatment	In-situ Treatment	Soil Vapor Extraction	A vacuum is placed on extraction wells creating a gradient for the transport of volatiles from the soil to the gas phase to the extraction wells for recovery.	Potentially applicable.
Treatment	In-situ Treatment	Bioventing	Air is drawn through the contaminated soil to enhance the biodegradation of contaminants.	Rejected as the CVOCs present in the soil are not readily biodegraded under aerobic conditions.

307313

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
Treatment	In-situ Treatment	Steam Injection Combined with Vapor Extraction	Steam is injected into the contaminated soil to increase the mobility of volatiles for extraction.	Potentially applicable.
Treatment	In-situ Treatment	Hot Air Injection Combined with Vapor Extraction	Hot air is injected into the contaminated soil to increase the mobility of volatiles for extraction.	Potentially applicable.
Treatment	In-situ Treatment	Electrical Resistance Heating with Vapor Extraction	Electrodes placed in the ground create a current which causes the contaminated soil to heat up to increase the mobility of volatiles for extraction.	Potentially applicable.
Treatment	In-situ Treatment	Radio-frequency Heating with Vapor Extraction	Radio frequency is used to heat up the contaminated soil to increase the mobility of volatiles for extraction.	Potentially applicable.
Treatment	In-situ Treatment	Bioremediation	Bioremediation is a process that uses bacteria to degrade contaminants. Nutrients and other amendments may be introduced into the contaminated soil to enhance the biodegradation.	Potentially applicable.
Treatment	In-situ Treatment	Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize and/or destroy contaminants in soil.	Rejected as a majority of the contaminated area is located beneath pavement and building coverage at this active industrial facility.
Treatment	In-situ Treatment	Chemical Reduction/Oxidation	Reduction/oxidation is a process that chemically converts contaminants to nonhazardous or less toxic compounds that are stable, less mobile and/or inert. Ozone and Hydrogen peroxide are commonly used oxidizers.	Potentially applicable.
Treatment	In-situ Treatment	Soil Flushing	Water or water containing additives to enhance contaminant solubility is applied to the contaminated soil. The water leaches contaminants from the soil to the ground water which itself is treated.	Rejected due to difficulty of injecting flushing material beneath building structures, uncertainty of flushing liquid contacting less permeable soils and controlling flow and recovery of flushing liquid.
Treatment	In-situ Treatment	Vitrification	Electrodes placed in the ground creating a current which causes the contaminated soil to melt, producing a glass and crystalline structure with very low leaching characteristics.	Rejected due to hazards associated with this process (high heat, high electric current) and site conditions such as shallow depth of contaminants beneath an active building structure. This method is geared towards inorganic contamination.
Disposal	On-site	On-site Landfill	Excavated soil is permanently disposed in an on-site RCRA landfill.	Rejected as the Klockner Property is a developed and active industrial property with limited room for an on-site landfill.

307314

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
Disposal	Off-site	Off-site RCRA Landfill	Excavated soil is transported to a RCRA landfill (Subtitle C or D) depending on classification. Waste may require treatment at disposal facility before be placed in landfill.	Potentially applicable.

307315

TABLE 3
Preliminary Screening of Technologies and Process Options for Lead Remediation

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
No Action	None	Not Applicable	No actions are taken.	Required for consideration by NCP
Institutional Controls	Access and Use Restrictions	Deed Restrictions	Deed notice identifies presence of soil contamination, restrictions concerning contaminated area, notice requirements and maintenance requirements.	Potentially applicable.
Institutional Controls	Monitored Attenuation	Contaminant Monitoring	Attenuation of contaminant is monitored.	Rejected as this process is not applicable to the shallow Lead soil contamination at the Klockner Property.
Containment	Cap	Clay and Soil	Placement of clay overlain with soil over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Rejected as other capping materials are appropriate given the current development and use of the Klockner Property.
Containment	Cap	Asphalt	Placement of asphalt over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Cap	Concrete	Placement of concrete over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Cap	Multi Media	Placement of multi-media cap over contaminated soil to limit infiltration of surface water and prevent surface exposure to contaminants.	Potentially applicable.
Containment	Subsurface Barriers	All Processes	Includes use of grouts or low permeability slurries to form impermeable subsurface barriers.	Rejected as the Lead contamination is not readily mobile in the subsurface at the site and the size of the area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Removal	Excavation	Excavation	Contaminated soil is excavated for transport.	Potentially applicable.
Treatment	On-Site Incineration	Fluidized Bed or Rotary Kiln	Contaminated soil is heated to high temperatures to volatilize and combust organic contaminants.	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	On-Site Thermal Desorption	Heating Units	Contaminated soil is heated to low to medium temperatures to volatilize water and organic contaminants. Volatiles are collected in a gas treatment system.	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	Aeration	Vapor Extraction	Air is drawn through contaminated soil creating a gradient for the transport of volatiles from the soil to gas phase. Volatiles are collected in a gas treatment system.	Rejected as it is not applicable to the Lead soil contamination found at the site.

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
Treatment	Physical/Chemical	Soil Washing	Contaminated soil is treated in an aqueous based system that separates contaminants from the soil particles. The wash water may contain various agents to help remove organics and heavy metals.	Rejected as the size of the Lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Treatment	Physical/Chemical	Solidification/Stabilization/Fixation	Contaminated soil is treated with materials that cause the contaminants to be bound or enclosed within the treated matrix so that it can not leach out.	Rejected as the size of the Lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Treatment	Physical/Chemical	Solvent Extraction	Contaminated soil is mixed with solvent which extracts the contaminant from the soil. The solvent/extract mixture is then treated further.	Rejected as the size of the Lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Treatment	Biological	Aerobic or Anaerobic	Excavated soil is mixed with soil amendments and placed in an aboveground enclosure for treatment. The treatment can be done as a solid phase or as a slurry.	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	In-situ Treatment	Soil Vapor Extraction	A vacuum is placed on extraction wells creating a gradient for the transport of volatiles from the soil to the gas phase to the extraction wells for recovery.	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	In-situ Treatment	Bioventing	Air is drawn through the contaminated soil to enhance the biodegradation of contaminants.	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	In-situ Treatment	Steam Injection Combined with Vapor Extraction	Steam is injected into the contaminated soil to increase the mobility of volatiles for extraction	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	In-situ Treatment	Hot Air Injection Combined with Vapor Extraction	Hot air is injected into the contaminated soil to increase the mobility of volatiles for extraction	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	In-situ Treatment	Electrical Resistance Heating with Vapor Extraction	Electrodes placed in the ground creating a current which causes the contaminated soil to heat up to increase the mobility of volatiles for extraction.	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	In-situ Treatment	Radio-frequency Heating with Vapor Extraction	Radio frequency is used to heat up the contaminated soil to increase the mobility of volatiles for extraction.	Rejected as it is not applicable to the Lead soil contamination found at the site.

307317

General Response Action	Remedial Technology	Process Options	Description	Screening Comment
Treatment	In-situ Treatment	Bioremediation	Bioremediation is a process that uses bacteria to degrade contaminants. Nutrients and other amendments may be introduced into the contaminated soil to enhance the biodegradation.	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	In-situ Treatment	Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize and/or destroy contaminants in soil.	Rejected as the size of the Lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation. Also, the contaminated area is located beneath pavement in this active industrial facility.
Treatment	In-situ Treatment	Chemical Reduction/Oxidation	Reduction/oxidation is a process that chemically converts contaminants to nonhazardous or less toxic compounds that are stable, less mobile and/or inert. Ozone and Hydrogen peroxide are commonly used oxidizers.	Rejected as it is not applicable to the Lead soil contamination found at the site.
Treatment	In-situ Treatment	Soil Flushing	Water or water containing additives to enhance contaminant solubility is applied to the contaminated soil. The water leaches contaminants from the soil to the ground water which itself is treated.	Rejected as the size of the Lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Treatment	In-situ Treatment	Vitrification	Electrodes placed in the ground creating a current which causes the contaminated soil to melt, producing a glass and crystalline structure with very low leaching characteristics.	Rejected as the size of the Lead contaminated area that requires remediation is too small to warrant this type of process. There are more effective and practical methods for remediation.
Disposal	On-site	On-site Landfill	Excavated soil is permanently disposed in an on-site RCRA landfill.	Rejected as the Klockner Property is a developed and active industrial property with limited room for an on-site landfill.
Disposal	Off-site	Off-site RCRA Landfill	Excavated soil is transported to a RCRA landfill (Subtitle C or D) depending on classification. Waste may require treatment at disposal facility before be placed in landfill.	Potentially applicable.

307318

5.5 Evaluation of Retained Remedial Technologies and Process Options

The results of the initial screening process identified remedial technologies and process options potentially applicable for the remediation of the contaminated soil at the site. The remedial action applies to one inorganic contaminant (Lead) and two volatile organic compounds (TCE and PCE). The Lead contamination is confined to a limited area along the northeast border of the Building 12 Property. TCE and PCE are present beneath asphalt paved and building covered areas at the Building 12 Property and PCE is present in an unpaved area at the Building 13 Property.

The Remedial Technologies and Process Options that survived the initial screening process were reevaluated on the basis of short and long-term aspects of three broad categories: effectiveness, implementability and cost. The purpose of this reevaluation is to narrow the number of Remedial Technologies and Process Options that will be developed into Remedial Alternatives.

Effectiveness evaluation of the alternative is performed to determine its effectiveness in protecting human health and the environment and its effectiveness in reducing toxicity, mobility and volume of the contaminant.

Implementability evaluation is based on both technical and administrative feasibility of the specific technology. It is used to screen technologies and process options to eliminate those that are ineffective or unworkable at the site.

The cost evaluation at this stage is intended to provide a relative comparison of process options within a technology type.

The reevaluation of the Remediation Technologies and Process Options is presented in Tables 4 and 5 for CVOCs and Lead respectively. The retained technologies based on the reevaluation are identified in Tables 6 and 7. Information concerning each of the potentially applicable remedial technologies reevaluated is presented in Section 5.6.

5.5.1 Remedial Technologies and Process Options for TCE and PCE

The following is a list of possible Remedial Technologies and Process Options for remediating the TCE and PCE soil contamination at the Klockner Property. The reevaluation of these process options with respect to effectiveness, implementability and cost is presented in Table 4.

307319

1. No Action

2. Access and Use Restrictions

3. Capping

4. Excavation and Disposal Off Site

5. In-situ Treatment
   - Soil Vapor Extraction (SVE)
   - In situ Thermal Treatment/ with SVE
     - Steam Injection with SVE
     - Hot Air Injection with SVE
     - Electrical Resistance Heating with SVE
     - Radio Frequency Heating with SVE
   - Bioremediation
   - Oxidation/Reduction

5.5.2 Remedial Technologies and Process Options for Lead

The following is a list of possible Remedial Technologies and Process Options for remediating the Lead soil contamination at the Klockner Property. The reevaluation of these process options with respect to effectiveness, implementability and cost is presented in Table 5.

1. No Action

2. Access and Use Restrictions

3. Capping

4. Excavation and Disposal Off Site

307320

TABLE 4
Evaluation of Remedial Technologies and Process Options for TCE and PCE Remediation

General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
No Action	None	Not Applicable	Does not achieve remedial action objective.	Easily implemented.	None
Institutional Controls	Access and Use Restrictions	Deed Restriction	Does not achieve remedial action objective. Effectiveness depends on enforcement of restrictions. Used in conjunction with other technologies.	Easily implemented. Restrictions on future land use.	Low capital cost, low maintenance cost
Containment	Cap	Asphalt	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented., Restrictions on future land use.	Low capital cost, moderate maintenance cost.
Containment	Cap	Concrete	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented. Restrictions on future land use.	Moderate capital cost, moderate maintenance cost
Containment	Cap	Multi Media	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Disruptive to facility operations and therefore, not easily implemented, Restrictions on future land use.	High capital cost, moderate maintenance cost
Removal	Excavation	Excavation	Effective proven reliable technology. Short term effects include noise and dust. Would be used in conjunction with off-site disposal.	Difficult to implement due to location of contamination beneath the concrete floor inside Building 12. Easily implemented at Building 13 PCE soil contamination.	High Cost for TCE and PCE soil contamination at Building 12; and Low cost for PCE soil contamination at Building13, No maintenance
Treatment	In-situ Treatment	Soil Vapor Extraction	Effective proven technology and a presumptive remedy for VOCs.	Easily implemented. There would be some disruption to facility operations during system installation.	Low to moderate capital cost, moderate maintenance cost
Treatment	In-situ Treatment	Steam injection combined with vapor extraction	Effective in reducing VOCs in soil under appropriate site conditions.	Moderate implementability. Difficulty in controlling steam flow in shallow soils, concerns with safety (heat) in tenant occupied areas.	Moderate capital cost, moderate maintenance cost
Treatment	In-situ Treatment	Hot air injection combined with vapor extraction	Not as effective as steam injection due to low heat capacity of air.	Moderate implementability. Difficulty in controlling air flow in shallow soils, concerns with safety (heat) in tenant occupied areas.	Moderate capital cost, moderate maintenance cost

307321

General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
Treatment	In-situ Treatment	Electrical resistance heating with soil vapor extraction	Moderately effective, based on case study it may not reduce contaminants to meet remedial action objectives. This is a relatively new technology.	Moderate implementability. Would be disruptive to tenant's operations.	High capital cost, moderate maintenance cost
Treatment	In-situ Treatment	Radio-frequency heating with soil vapor extraction	Studies would be required to determine the effectiveness of this technology. This is a relatively new technology.	Moderate implementability. Would be disruptive to tenant's operations. This is a relatively new technology and equipment may not be readily available.	High capital cost, moderate maintenance cost
Treatment	In-situ Treatment	Bioremediation	Low to moderate effectiveness, Chlorinated VOCs do not readily break down, this is a slow process.	Moderate to difficult implementability. Difficulty in controlling delivery of nutrients and amendments to contaminated soil given site conditions.	Moderate capital cost, moderate maintenance cost
Treatment	In-situ Treatment	Chemical Oxidation	Studies would be required to determine the effectiveness of this technology. There are several oxidants available for use with TCE and PCE.	Moderate to difficult implementability. Difficulty in controlling delivery of the oxidant and safety concerns in tenant's operations in building area above contaminated soil.	High capital cost, moderate maintenance
Disposal	Off-site	Off-site RCRA Landfill	Effective in removing contaminants to remedial action objectives. Moves contaminants from Klockner Property to a controlled landfill facility where treatment prior to disposal may be required. Conducted in concert with Excavation.	Difficult to implement due to location of contamination beneath the concrete floor inside Building 12. Easily implemented at Building 13 PCE soil contamination.	Low cost for non-hazardous disposal, High cost for hazardous disposal

307322

TABLE 5

Evaluation of Remedial Technologies and Process Options for Lead Remediation

General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
No Action	None	Not Applicable	Does not achieve remedial action objective.	Easily implemented. May not be acceptable to local/federal authorities.	None
Institutional Controls	None	Deed Restriction	Does not achieve remedial action objective.	Does not achieve remedial action objective	Low capital, low maintenance
Containment	Cap	Asphalt	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented. Restrictions on future land use.	Low capital cost, low maintenance cost
Containment	Cap	Concrete	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented. Restrictions on future land use.	Low capital cost, low maintenance cost
Containment	Cap	Multi Media	Effective in reducing potential contact with contaminants and reducing surface infiltration, if properly maintained.	Easily implemented. Restrictions on future land use. A good portion of the contaminated soil would be excavated to allow construction of the cap.	Moderate capital cost, moderate maintenance cost
Removal	Excavation	Excavation	Very effective, conducted in concert with Disposal.	Easily Implemented. The Lead contamination is confined to a relatively small area of the parking lot.	Low cost
Disposal	Off-site	Off-site RCRA Landfill	Very effective, conducted in concert with Excavation.	Easily Implemented. The Lead contamination is confined to a relatively small area of the parking lot.	Low cost if disposed as hazardous or non-hazardous

307323

5.6 Description of Potential Remedial Technologies

A description of potentially applicable remedial technologies from the initial screening process (see Tables 2 and 3) follows. Tables 4 and 5 present an evaluation of the remedial technologies with respect to effectiveness, implementability and cost. The technologies evaluated include presumptive remedies. Where available, initial cost information is provided. Only the seriously considered remedial technologies are discussed in detail.

Soil vapor extraction (SVE), thermal desorption, and incineration are the presumptive remedies at Superfund sites with soils contaminated with halogenated volatile organic compounds (VOCs). Because a presumptive remedy is a technology that EPA believes, based upon its past experience, generally will be the most appropriate remedy for a specified type of site, the presumptive remedy approach will accelerate site-specific analysis of remedies by focusing the feasibility study efforts.

SVE is the EPA preferred presumptive remedy for VOCs. SVE has been selected most frequently to address VOC contamination at Superfund sites, and performance data indicate that it effectively treats waste in place at a relatively low cost. In cases where SVE will not work or where uncertainty exists regarding the ability to obtain required cleanup levels, thermal desorption may be the most appropriate response technology. In a limited number of situations, incineration may be most appropriate. Thermal desorption and incineration have been removed from consideration during the initial screening based on site conditions and high cost.

5.6.1 No Action

5.6.1.1 Description

Under the no action alternative, the remediation of the contaminated soils at the Klockner & Klockner property portion of Operable Unit #3 would end. There would be no reduction in the toxicity, and volume of contamination. Evaluation of the no action alternative is required under by EPA, as it provides a baseline against which impacts of other alternatives can be compared.

5.6.1.2 Applicability

No Action alternative is applicable for TCE, PCE and Lead soil contamination.

5.6.1.3 Limitations

The no action alternative could expose humans and the environment to contaminated soil and ground water. The VOCs present in the soil would remain as a potentially continuing source of ground water contamination. Under this alternative, there would be no remediation, monitoring, or controls over the contaminated site. Exposure could occur in the following ways:

- Migration of the contamination to ground water
- Migration of contaminant to off-site location
- Vapor intrusion from contaminated soil and ground water

5.6.1.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content). This data identifies the site conditions and location of contaminants.

5.6.1.5 Performance Data

No action alternative is implemented in situations where the concentration of the contaminant is very low and the potential for migration is low.

5.6.1.6 Cost

This is the lowest cost alternative as no action is required for remediation.

5.6.1.7 Results of Evaluation

The No Action GRA will be carried through the evaluation process as required under NCP.

5.6.2 Access and Use Restrictions

5.6.2.1 Description

Access and Use Restrictions are designed to reduce exposure to toxic chemicals and protect human health by restricting land use. The most common Access and Use Restriction is a restrictive covenant in the form of deed notice.

5.6.2.2 Applicability

Access and Use Restrictions are applicable for TCE, PCE and Lead soil contamination.

307325

5.6.2.3 Limitations

Access and Use Restrictions do not reduce the toxicity, mobility or the volume of the contaminant. A deed notice would specify any requirements for monitoring, maintenance of potential engineering controls and restrictions on property use to prevent the dispersion of or exposure to any contaminated soil. Restrictive covenants would also require notification of the presence of soil contamination and can be long term.

5.6.2.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content).

5.6.2.5 Performance Data

Access and Use Restrictions are readily available and have been successfully used.

5.6.2.6 Cost

The cost of imposing Access and Use Restrictions is low as they involve long term monitoring and legal and administrative costs.

5.6.2.7 Results of Evaluation

Access and Use Restrictions is being retained for further evaluation as it is an important component for conducting other remedial technologies, (i.e. capping).

5.6.3 Capping

5.6.3.1 Description

Capping is a common form of remediation because it is generally less expensive than other technologies and effectively manages the human and ecological risks associated with a remediation site. The most common caps are Asphalt, Concrete and Multi Media.

The most effective single-layer caps are composed of concrete or bituminous asphalt. It is used to form a surface barrier between contaminated soil and the environment. An asphalt or concrete cap would reduce leaching through the soil into an adjacent aquifer.

307326

5.6.3.2 Applicability

Caps prevent direct contact with contaminated soil and prevent vapor intrusion. They also minimize surface water infiltration through the contaminated soil and the migration of contaminants into the ground water. In conjunction with water diversion and detention structures, caps may be designed to route surface water away from the contaminated soil. Capping is applicable for TCE, PCE and Lead soil contamination. As a majority of the contaminants are already under the foot print of the building, it is already capped. The remaining area outside the building can be easily capped to prevent migration of the contaminants.

5.6.3.3 Limitations

Capping does not lessen toxicity or volume of the contaminant, but does mitigate migration and exposure, including direct contact with contaminated soil. Caps are most effective where most of the underlying contaminant is above the water table. A cap, by itself, cannot prevent the horizontal flow of ground water through the waste, only the vertical entry of water into the waste. Caps can be used in conjunction with vertical walls/barriers to minimize horizontal flow and migration. Caps are susceptible to weathering and cracking. Therefore, the effective life of a cap can be extended by long-term inspection and maintenance. Precautions must be taken to assume that the integrity of the cap is not compromised by land use activities. A restriction on future land use would be required.

5.6.3.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, condition and type of existing cover (e.g. asphalt, concrete soil), depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content).

5.6.3.5 Performance Data

Previously installed caps are hard to monitor for performance. Monitoring well systems or infiltration monitoring systems can provide some information, but it is often not possible to determine the source of the contaminant. Caps are often installed to prevent, or significantly reduce, the migration of contaminants in soils or ground water. Containment is necessary whenever contaminated materials are to be buried or left in place at a site. In general, containment is performed when extensive subsurface contamination at a site precludes excavation and removal of wastes because of potential hazards or lack of adequate treatment technologies.

307327

5.6.3.6 Cost

Containment treatment such as caps offer quick installation times and are typically a low to moderate cost treatment group. Unlike ex situ treatment groups, containment does not require excavation of soils that lead to increased costs from engineering design of equipment, possible permitting, and material handling. However, capping requires periodic inspections. Additionally, ground water monitoring wells, associated with the treatments, may need to be periodically sampled and maintained. Even with these long-term requirements, containment treatments usually are considerably more economical than excavation and removal of the wastes.

5.6.3.7 Results of Evaluation

Capping is being retained for further evaluation based on the above information.

5.6.4 Excavation, and Off-Site Disposal

5.6.4.1 Description

Contaminated material is removed and transported to permitted off-site treatment and/or disposal facilities. Some pretreatment of the contaminated media usually is required in order to meet land disposal restrictions.

Operation and maintenance duration lasts as long as the life of the disposal facility.

5.6.4.2 Applicability

Excavation and off-site disposal is applicable to the complete range of contaminant groups with no particular target group. Therefore, it is applicable for TCE, PCE and Lead soil contamination.

5.6.4.3 Limitations

Factors that may limit the applicability and effectiveness of the process include:

- Generation of fugitive emissions may be a problem during operations.
- The distance from the contaminated site to the nearest disposal facility with the required permit(s) will affect cost.
- Depth and composition of the media requiring excavation must be considered.
- Transportation of the soil through populated areas may affect community acceptability.
- Limited accessibility of the contaminated area to excavation in areas beneath the active building structure.

307328

5.6.4.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type.

5.6.4.5 Performance Data

Excavation and off-site disposal is a well proven and readily implementable technology. Excavation is the initial component in all ex situ treatments.

CERCLA includes a statutory preference for treatment of contaminants, and excavation and off-site disposal is now less acceptable than in the past. The disposal of hazardous wastes is governed by RCRA (40 CFR Parts 261-265), and the U.S. Department of Transportation (DOT) regulates the transport of hazardous materials (49 CFR Parts 172-179, 49 CFR Part 1387, and DOT-E 8876). Wastes can be disposed at a solid waste landfill if categorized as nonhazardous.

5.6.4.6 Cost

Cost estimates for excavation and disposal as a hazardous waste range from $300 to $510 per metric ton ($270 to $460 per ton). These estimates include excavation/removal, transportation, and disposal at a RCRA permitted facility. The estimated cost for excavation and disposal as a non-hazardous waste range from $165 to $220 per metric ton ($150 to $200 per ton). Additional cost of treatment at disposal facility may also be required. Excavation and off-site disposal is a relatively simple process, with proven procedures. It is a labor-intensive practice with little potential for further automation. Additional costs may include soil characterization and treatment to meet land ban requirements.

5.6.4.7 Results of Evaluation

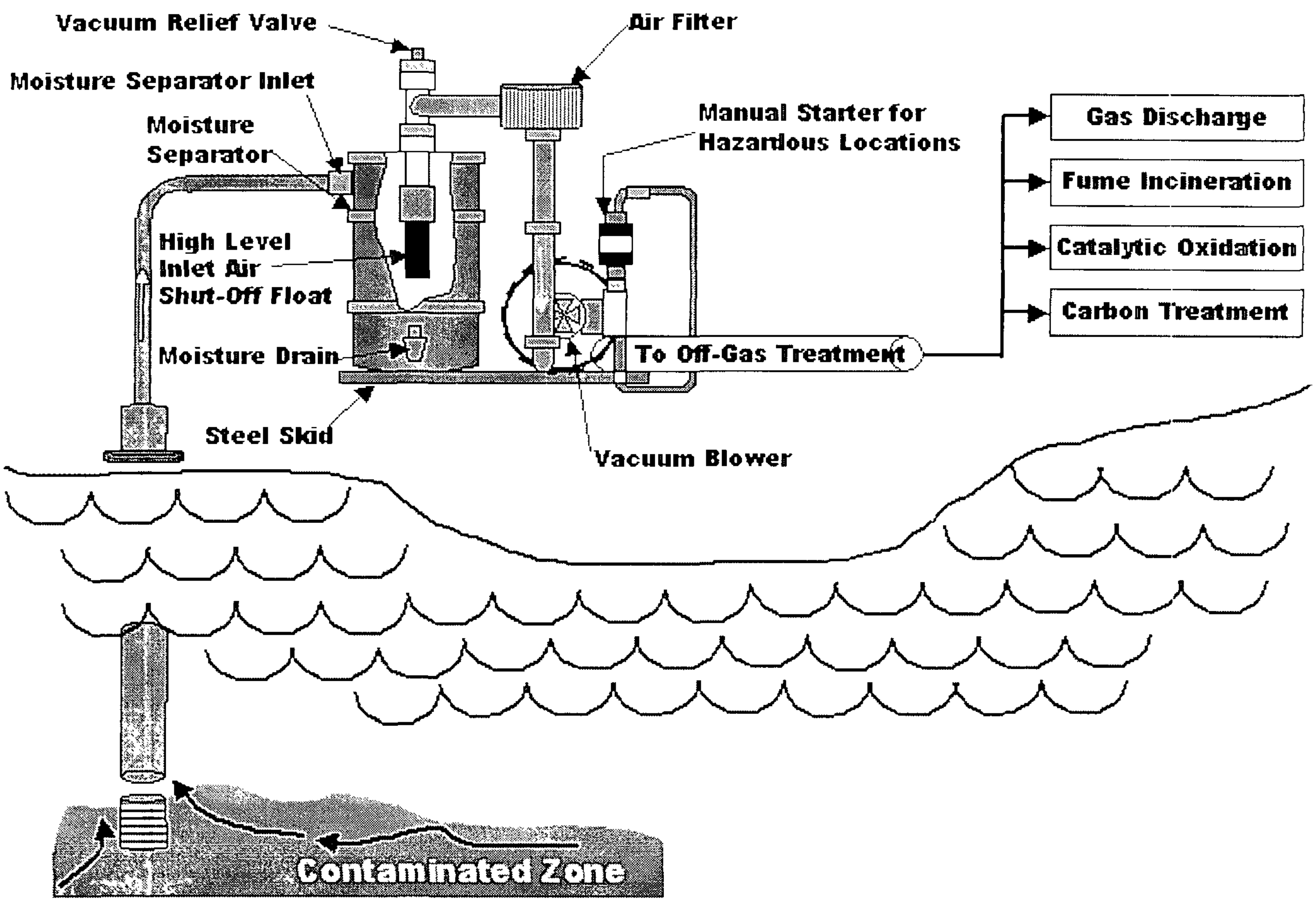
Excavation with off-site disposal is being retained for further evaluation based on the above information.

5.6.5 In-situ Treatment - Soil Vapor Extraction

A vacuum is applied through extraction wells to create a pressure/concentration gradient that induces gas-phase volatiles to be removed from soil through extraction wells. This technology also is known as in situ soil venting, in situ volatilization, enhanced volatilization, or soil vacuum extraction.

307329

Typical In Situ Soil Vapor Extraction System



SVE is an in situ unsaturated (vadose) zone soil remediation technology in which a vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semivolatile contaminants from the soil. The gas leaving the soil may be treated to recover or destroy the contaminants, depending on local and state air discharge regulations. Potential options for off-gas treatment include incineration, catalytic oxidation and carbon adsorption. The type of off-gas treatment used will be dependent on the concentration of contaminants in the off-gas, the flow rate of the off-gas and type of contaminants present. Vertical extraction vents are typically used at depths of 1.5 meters (5 feet) or greater. Horizontal extraction vents (installed in trenches or horizontal borings) can be used as warranted by contaminant zone geometry, drill rig access, or other site-specific factors.

Ground water depression pumps may be used to reduce ground water upwelling induced by the vacuum or to increase the depth of the vadose zone. Air injection is effective for facilitating extraction of deep contamination, contamination in low permeability soils, and

307330

contamination in the saturated zone. The duration of operation and maintenance for in situ SVE is typically 1 to 3 years.

5.6.5.1 Applicability

The target contaminant groups for in situ SVE are VOCs and some fuels. The technology is typically applicable only to volatile compounds with a Henry's law constant greater than 0.01 or a vapor pressure greater than 0.5 mm Hg (0.02 inches Hg). Vapor Pressure for TCE is 58 mm of Hg, and for PCE it is 18.47 mm of Hg, making them good candidates for the process. Other factors, such as the moisture content, organic content, and air permeability of the soil, also will impact the effectiveness of in situ SVE. Because the process involves the continuous flow of air through the soil, however, it often promotes the in situ biodegradation of low-volatility organic compounds that may be present. SVE is not applicable to Lead.

5.6.5.2 Limitations

Factors that may limit the applicability and effectiveness of the process include:

- Soil that has a high percentage of fines and a high degree of saturation will require higher vacuums (increasing costs) and/or will hinder the operation of the in situ SVE system.
- Large screened intervals are required in extraction wells for soil with highly variable permeabilities or stratification, which otherwise may result in uneven delivery of gas flow from the contaminated regions.
- Soil that has high organic content or is extremely dry has a high sorption capacity of VOCs, which results in reduced removal rates.
- Exhaust air from in situ SVE system may require treatment to eliminate possible harm to the public and the environment.
- As a result of off-gas treatment, residual liquids may require treatment/disposal. Spent activated carbon definitely will require regeneration or disposal.
- SVE is not effective in the saturated zone.

5.6.5.3 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content).

307331

Pilot studies should be performed to provide design information, including extraction well, radius of influence, gas flow rates, optimal applied vacuum, and contaminant mass removal rates.

5.6.5.4 Performance Data

A field pilot study is necessary to establish the feasibility of the method as well as to obtain information necessary to design and configure the system. During full-scale operation, in situ SVE can be operated intermittently (pulsed operation) once the extracted mass removal rate has reached an asymptotic level. This pulsed operation can increase the cost-effectiveness of the system by facilitating extraction of higher concentrations of contaminants. After the contaminants are removed by in situ SVE, other remedial measures, such as biodegradation or engineering controls, can be investigated if remedial action objectives have not been met. In situ SVE projects are typically completed in 1 to 3 years.

5.6.5.5 Cost

The cost of in situ SVE is site-specific, depending on the size of the site, the nature and amount of contamination, and the hydrogeological setting (EPA, July 1989). These factors affect the number of wells, the blower capacity and vacuum level required, and the length of time required to remediate the site. A requirement for off-gas treatment adds significantly to the cost. Water is also frequently extracted during the process and usually requires treatment prior to disposal, further adding to the cost. Cost estimates for in situ SVE range between $10 and $50 per cubic meter ($10 and $40 per cubic yard) of soil. Pilot testing typically costs $10,000 to $40,000.

5.6.5.6 Results of Evaluation

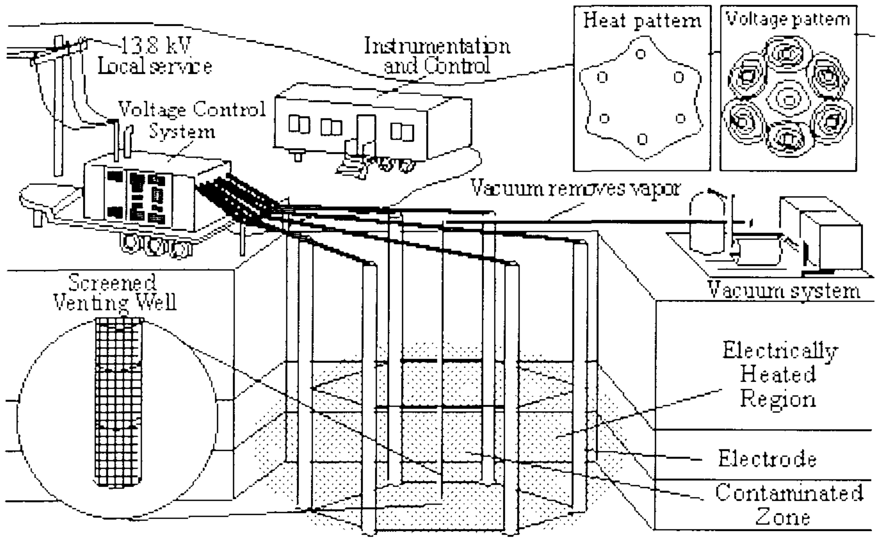
In-situ SVE is being retained for further evaluation as it is a presumptive remedy for VOCs soil contamination and is relatively cost effective.

5.6.6 In Situ Thermal Treatment

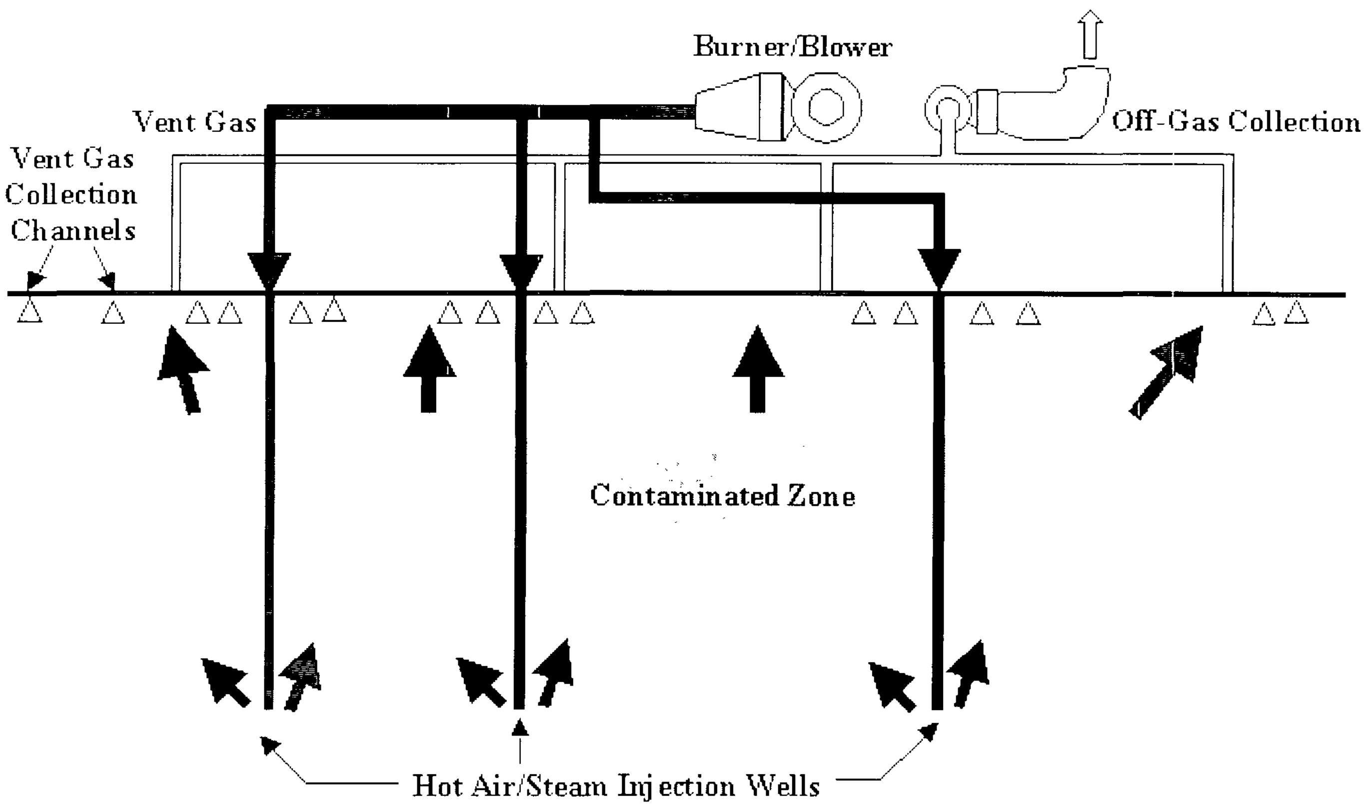
In situ thermal treatment is a full-scale technology that uses electrical resistance/electromagnetic/fiber optic/radio frequency heating or hot-air/steam injection to increase the volatilization rate of semi-volatiles and volatiles and facilitate extraction. The volatilized contaminants are collected by SVE. These technologies are discussed below.

307332

Typical Six-Phase Soil Heating System



Typical Hot Air System



307333

The process is otherwise similar to standard SVE, but requires heat resistant extraction wells. In situ thermal treatment with SVE is normally a short-term technology.

5.6.6.1 Electrical Resistance Heating

Electrical resistance heating uses an electrical current to heat less permeable soils such as clays and fine-grained sediments so that water and contaminants trapped in these relatively conductive regions are vaporized and ready for vacuum extraction. Electrodes are placed directly into the less permeable soil matrix and activated so that electrical current passes through the soil, creating a resistance, which then heats the soil. The heat dries out the soil causing it to fracture. These fractures make the soil more permeable allowing the use of SVE to remove the contaminants. The heat created by electrical resistance heating also forces trapped liquids to vaporize and move to the steam zone for removal by SVE. Six-phase soil heating (SPSH) is a typical electrical resistance heating which uses low-frequency electricity delivered to six electrodes in a circular array to heat soils. With SPSH, the temperature of the soil and contaminant is increased, thereby increasing the contaminant's vapor pressure and its removal rate. SPSH also creates an in situ source of steam to strip contaminants from soil. At this time SPSH is in the demonstration phase, and all large scale in situ projects utilize three-phase soil heating.

5.6.6.2 Radio Frequency/Electromagnetic Heating

Radio frequency heating (RFH) is an in situ process that uses electromagnetic energy to heat soil and enhance SVE. The RFH technique heats a discrete volume of soil using rows of vertical electrodes embedded in soil (or other media). Heated soil volumes are bounded by two rows of ground electrodes with energy applied to a third row midway between the ground rows. The three rows act as a buried triplate capacitor. When energy is applied to the electrode array, heating begins at the top center and proceeds vertically downward and laterally outward through the soil volume. The technique can heat soils to over 300 °C.

RFH enhances SVE in four ways: (1) contaminant vapor pressure and diffusivity are increased by heating, (2) the soil permeability is increased by drying, (3) an increase in the volatility of the contaminant from in situ steam stripping by the water vapor, and (4) a decrease in the viscosity which improves mobility. The technology is self limiting; as the soil heats and dries, current will stop flowing. Extracted vapor can then be treated by a variety of existing technologies, such as granular activated carbon or incineration.

307334

5.6.6.3 Hot Air/Steam Injection

Hot air or steam is injected below the contaminated zone to heat up contaminated soil. The heating enhances the release of contaminants from the soil matrix. Some VOCs and SVOCs are stripped from the contaminated zone and brought to the surface through SVE.

5.6.6.4 Applicability

High moisture content is a limitation of standard SVE that thermal enhancement may help overcome. Heating, especially radio frequency heating and electrical resistance heating can improve air flow in high moisture soils by evaporating water. The system is designed to treat semivolatiles but will consequently treat volatiles. In situ thermal treatment is not applicable to Lead. After application of this process, subsurface conditions are excellent for biodegradation of residual contaminants.

5.6.6.5 Limitations

The following factors may limit the applicability and effectiveness of the process:

- Debris or other large objects buried in the media can cause operating difficulties.
- Performance in extracting certain contaminants varies depending upon the maximum temperature achieved in the process selected.
- Soil that is tight or has high moisture content has a reduced permeability to air, hindering the operation of thermally enhanced SVE and requiring more energy input to increase vacuum and temperature.
- Soil with highly variable permeabilities may result in uneven delivery of gas flow to the contaminated regions.
- Soil that has a high organic content has a high sorption capacity of VOCs, which results in reduced removal rates.
- Air emissions may need to be regulated to eliminate possible harm to the public and the environment. Air treatment and permitting will increase project costs.
- Residual liquids and spent activated carbon may require further treatment.
- Thermally enhanced SVE is not effective in the saturated zone; however, lowering the aquifer can expose more media to SVE.
- Hot air injection has limitations due to low heat capacity of air.
- Difficulty in controlling the direction of the steam/hot air migration through the shallow silty clay.

307335

5.6.6.6 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, depth to water table, and soil type and properties (e.g., structure, texture, permeability, and moisture content).

Pilot studies should be performed to provide design information, including extraction well, radius of influence, gas flow rates, optimal applied vacuum, optimal heat injection and contaminant mass removal rates.

5.6.6.7 Performance Data

Thermal Treatment has been used for the remediation of solvent contaminated soils. Its success will depend on the soil and site conditions. A field pilot study is necessary to establish the feasibility of the method as well as to obtain information necessary to design and configure the system. After the contaminants are removed by in situ thermal treatment, other remedial measures, such as biodegradation or engineering controls, can be investigated if remedial action objectives have not been met.

5.6.6.8 Cost

Available data indicate the overall cost for thermally enhanced SVE systems is approximately \$30 to \$130 per cubic meter (\$25 to \$100 per cubic yard) for some methods. High capital costs are anticipated for the Electrical Resistance Heating and Radio Frequency Heating options.

5.6.6.9 Results of Evaluation

In-situ thermal treatment is not being retained for further evaluation based on the reasons presented in 5.6.6.5 Limitations above.

5.6.7 In-Situ Bioremediation

5.6.7.1 Description

During in-situ bioremediation, the activity of naturally occurring microbes is stimulated by circulating water-based solutions through contaminated soils to enhance in-situ biological remediation of organic contaminants. Nutrients, oxygen, or other amendments may be used to enhance bioremediation and contaminant desorption from subsurface materials. Generally, the process includes above-ground treatment and conditioning of the infiltration water with nutrients

307336

and an oxygen (or other electron acceptor) source. In-situ bioremediation is a full-scale technology.

5.6.7.2 Applicability

Target contaminants for in-situ bioremediation are non-halogenated VOCs and SVOCs, and fuel hydrocarbons. Halogenated VOCs and SVOCs also can be treated, but the process may be less effective and may only be applicable to some compounds within these contaminant groups. In-situ bioremediation is not applicable to Lead.

5.6.7.3 Limitations

The following factors may limit the applicability and effectiveness of this process:

- Extensive treatability studies and site characterization may be necessary.
- The circulation of water-based solutions through the soil may increase contaminant mobility.
- The injection of microorganisms into the subsurface is not recommended. Naturally occurring organisms are generally adapted to the contaminants present.
- Preferential flow paths may severely decrease contact between injected fluids and contaminants throughout the contaminated zones.
- The system should be used only where ground water is near the surface and where the ground water underlying the contaminated soils is contaminated.
- The system should not be used for clay, highly layered, or heterogeneous subsurface environments due to oxygen (or other electron acceptor) transfer limitations.
- Bioremediation may not be applicable at sites with high concentrations of heavy metals, highly chlorinated organics, or inorganic salts.

5.6.7.4 Data Needs

Data requirements include the area and depth of contamination, the concentration of the contaminants, type of microorganisms present and soil type and properties (e.g., nutrients, structure, texture, permeability, and moisture content).

Bench scale and/or pilot studies should be performed to provide design information, including nutrient requirements and contaminant mass removal rates.

307337

5.6.7.5 Performance Data

Bioremediation has been successfully used for the treatment of chlorinated solvent contaminated soil. The success of the process may be limited by the clay content of the soil, ability to create anaerobic conditions and ability to deliver nutrients to the contaminated areas.

5.6.7.6 Cost

In-situ Bioremediation is a moderate cost alternative.

5.6.7.7 Results of Evaluation

In-situ Bioremediation is not being retained for further evaluation based on the reasons presented in 5.6.7.3 Limitations above.

5.6.8 In-situ Treatment – Chemical Oxidation

5.6.8.1 Description

In-situ chemical oxidation involves the injection of an oxidizing compound into the subsurface. One of several different oxidants used for this purpose is ozone. Ozone generating systems have been designed to destroy the contaminants PCE and TCE in situ. It has long been known that ozone is an extremely effective chemical oxidizer and much data has been published indicating the effectiveness of ozone for treating PCE, TCE, vinyl chloride, DCE, and other chlorinated solvents. Several projects conducted in the State of Florida at dry cleaning facilities have demonstrated the potential for ozone to clean up PCE and TCE contaminated sites. Other chemicals used for chemical oxidation include hydrogen peroxide and sodium permanganate.

5.6.8.2 Applicability

The target contaminant group for oxidation/reduction includes inorganics and organics. Oxidation/reduction is a well-established technology used for disinfecting drinking water and wastewater, and is a common treatment for cyanide wastes. Enhanced systems are now being used more frequently to treat hazardous wastes in soils.

In situ chemical oxidation using ozone generation system offers a number of significant advantages for on-site remediation, including:

- Potential for complete destruction of PCE and TCE without the formation of harmful byproducts
- PCE, TCE and other chlorinated solvents are treated in one system

307338

In situ oxidation is not applicable to Lead as it is an element.

5.6.8.3 Limitations

The following factors may limit the applicability and effectiveness of this process:

- Potential for incomplete oxidation or formation of intermediate contaminants that are more toxic than the original contaminants may occur depending upon the contaminants and oxidizing agents used. (The CVOCs of concern are readily oxidized with any potential intermediates being short lived and readily oxidized themselves.)
- The process is not cost-effective for highly contaminated materials due to the large amounts of oxidizing/reducing agents required.
- The chemicals used in oxidation/reduction pose a potential health and safety risk to site workers through skin contact and air emissions. Personal protective equipment, at a level commensurate with the contaminants involved, is normally required during treatment operations.

5.6.8.4 Data Needs

Engineering of in situ chemical oxidation must be done with due attention paid to reaction chemistry and transport processes. It is also critical that close attention be paid to worker training and safe handling of process chemicals as well as proper management of remediation wastes. The design and implementation process should rely on an integrated effort involving screening level characterization tests and reaction transport modeling, combined with treatability studies at the lab and field scale.

5.6.8.5 Performance Data

In situ chemical oxidation is a viable remediation technology for mass reduction in source areas as well as for plume treatment. The potential benefits of in situ oxidation include the rapid and extensive reactions with various COCs applicable to many bio-recalcitrant organics and subsurface environments. Also, in situ chemical oxidation can be tailored to a site and implemented with relatively simple, readily available equipment. Some potential limitations exist including the requirement for handling large quantities of hazardous oxidizing chemicals due to the oxidant demand of the target organic chemicals and the unproductive oxidant consumption of the formation; some COCs are resistant to oxidation; and there is a potential for process-induced detrimental effects. Further research and development is ongoing to advance the science and engineering of in situ chemical oxidation and to increase its overall cost effectiveness

307339

5.6.8.6 Cost

This is a moderate cost process option.

5.6.8.7 Result of Evaluation

Chemical Oxidation is not being retained for further evaluation based on the reasons presented in 5.6.8.3 Limitations above.

TABLE 6

Retained Technologies and Process Options for TCE and PCE Soil Remediation

General Response Action	Remedial Technology	Process Options
No Action	None	Not Applicable
Institutional Controls	Access and Use Restrictions	Deed Restrictions
Containment	Caps	Asphalt
		Concrete
Removal	Excavation	Excavation
Treatment	In-situ Treatment	Soil Vapor Extraction
Disposal	Off-site	Off-site RCRA Landfill

TABLE 7
Retained Technologies and Process Options for Lead Soil Remediation

General Response Action	Remedial Technology	Process Options
No Action	None	Not Applicable
Institutional Controls	Access and Use Restrictions	Deed Restrictions
Containment	Caps	Asphalt
		Concrete
Removal	Excavation	Excavation
Disposal	Off-site	Off-site RCRA Landfill

307340

6.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

6.1 Description of Remedial Alternatives

Using the retained remedial technologies and process options, Whitman has developed an array of remedial alternatives that can eliminate, reduce, or control the potential risks to human health and the environment present at the Klockner Property. The remedial alternatives are combinations of the retained remedial technologies and process options identified in Tables 6 and 7. A detailed analysis of the remedial alternatives will be conducted in the Feasibility Study.

The following key site-specific conditions also were considered during development of the Operable Unit #3 alternatives:

- the RAOs
- the distribution of TCE, PCE and Lead
- existing remedial actions
- a major transportation corridor
- the commercial and residential nature of the surface above the majority of the Klockner Property

They remedial alternatives differ primarily in the treatment location and the mode of treated waste disposal. The alternatives are described below.

6.1.1 Description of Remedial Alternatives

The retained remedial technologies and process options used to form the remedial alternatives described below include:

- No action
- Access and Use Restrictions – Deed Restrictions
- Capping – Asphalt and Concrete
- Excavation and Off-site Disposal
- In-situ Treatment - Soil Vapor Extraction (SVE)

The following remedial alternatives were formulated using the above listed remedial technologies and process options.

- Alternative 1: No Action
- Alternative 2: Access and Use Restrictions, and Capping
- Alternative 3: Excavation and Off-Site Disposal with Capping and Access and Use Restrictions

307341

- Alternative 4: Soil Vapor Extraction with Excavation and Off-Site Disposal, and Capping and Access and Use Restrictions

6.1.1.1 Alternative 1: No Action

The No Action Alternative (Alternative 1) would not actively control, treat, or monitor the contamination in soil. The TCE and PCE would be allowed to migrate, dissipate, and decay naturally. Lead in soil would migrate and dissipate. The No Action Alternative is retained for consideration in accordance with the NCP.

Cost: There would be no capital or operating, maintenance, or monitoring cost for this alternative. It would be the least expensive alternative.

Time: Concentrations of TCE, PCE and Lead would remain above clean-up goals for an indeterminate time.

6.1.1.2 Alternative 2: Access and Use Restrictions, and Capping

Alternative 2 is a combination of Access and Use Restrictions, and Capping. Under this alternative, the contaminated soil areas would be capped with asphalt or concrete. A Deed Notice would be filed with the appropriate authorities and interested parties identifying the access and use restrictions.

A cap prevents migration of the contaminants and prevents it from acting as a source. The primary route of contaminant migration from the soil to the ground water is typically through the movement of water through the soil column. If water is prevented from percolating through the contaminated soil, further migration could be prevented or limited. The presence of asphalt paved surfaces and concrete floored building coverage at the Building 12 Property will prevent the infiltration of water through the contaminated soil although some infiltration may occur (i.e. through damaged pavement). The former tank excavation area in the Building 12 alleyway and the Building 13 PCE soil contamination area are currently unpaved and would require paving with asphalt.

The area that would be capped by concrete floors at the Building 12 Property covers approximately 13,000 square feet. The area that would be capped with asphalt at the Building 12 Property covers approximately 5,900 square feet. The area that would be capped with asphalt at the Building 13 Property covers approximately 800 square feet.

Remedial Investigation studies show that the contamination at the site is limited to a depth of <5 to 7 feet. The contaminants remaining above the identified cleanup concentrations are mostly present in clayey silt, restricting further migration of the contaminants. Ground water levels fluctuate which is a potential contaminant migration pathway if a rise in the water table contacts remaining contaminants. This is not likely to occur in the areas targeted for remediation as the shallowest depth to ground water historically measured in the monitoring wells at the Klockner Property (see Attachment 2) has not been less than approximately 11 feet below grade while the soil contamination is present at depths <5 to 7 feet below grade.

The most common Institutional Control used for site remediation is a Deed Notice. Under this scenario, a Deed Notice notifying of the presence of soil contamination, requirements for maintaining any engineering controls and any restrictions on property use and disturbing contaminated soils would be imposed. A deed notice would identify requirements for monitoring to ensure that the conditions described therein are met to prevent potential exposure risks.

Cost: There would be a limited amount of capital or operating and maintenance cost for this alternative. Monitoring costs would continue for an extended period of time. Although the frequency of any necessary sampling would decrease over time, total monitoring costs could be substantial. Enforcement (maintenance) of the Deed Notice would be triggered when a property is sold or when construction permits or utility services are sought.

Time: Concentrations of TCE, PCE and Lead would remain above the remedial goals. The operation and maintenance required under Alternative 2 would be ongoing.

6.1.1.3 Alternative 3: Excavation and Off-Site Disposal with Capping and Access and Use Restrictions

Alternative 3 is a combination of Excavation and Off-Site Disposal with Access and Use Restrictions, and Capping. Under this alternative, the TCE, PCE and Lead contaminated soil areas present at paved and unpaved areas outside the building structures would be excavated and disposed of off-site. The TCE and PCE contaminated soil areas remaining beneath Building 12 would be capped. A Deed Notice would be filed with the appropriate authorities and interested parties identifying access and use restrictions associated with the contamination remaining beneath Building 12.

The TCE and PCE contaminated soil areas include the asphalt paved areas outside Building 12 as well as soil under the foot print of Building 12. PCE contaminated soil is present at an unpaved area at the Building 13 Property. The Lead contaminated soil area is located in the paved area near the Building 12 alleyway. The unpaved and asphalt paved areas are accessible for excavation with minimal disruption of the business operations at the site. The contaminated soils present outside the foot print of Building 12 and the contaminated soil present at the Building 13 Property would be excavated and transported to off-site disposal facilities. The type of facility (hazardous, non hazardous, pretreatment required) that the excavated soils would be disposed of at would depend on how the waste is characterized.

TCE and PCE contaminated soil will remain beneath Building 12 after the excavation and off-site disposal is conducted. Capping and Access and Use Restrictions would be used to address the remaining soil contamination. The cap would consist of the building floor which will prevent the infiltration of water through the contaminated soil although some infiltration may occur. A Deed Notice would be filed with the appropriate authorities and interested parties identifying the access and use restrictions.

The area that would be capped by concrete floors at the Building 12 Property covers approximately 13,000 square feet. The area that would be excavated at the Building 12 Property covers approximately 5,900 square feet and approximately 1,300 cubic yards of soil would be generated for off-site disposal. The area that would be excavated at the Building 13 Property covers approximately 800 square feet and approximately 150 cubic yards of soil would be generated for off-site disposal.

Remedial Investigation studies show that the contamination at the site is limited to a depth of <5 to 7 feet. The contaminants remaining above the identified cleanup concentrations are mostly present in clayey silt, restricting further migration of the contaminants. Ground water levels fluctuate which is a potential contaminant migration pathway if a rise in the water table contacts remaining contaminants. This is not likely to occur in the areas targeted for remediation as the shallowest depth to ground water historically measured in the monitoring wells at the Klockner Property (see Attachment 2) has not been less than approximately 11 feet below grade while the soil contamination is present at depths <5 to 7 feet below grade.

A Deed Notice notifying of the presence of soil contamination, requirements for maintaining any engineering controls and any restrictions on property use and disturbing contaminated soils would be imposed. A Deed Notice would identify requirements for monitoring to ensure that the conditions described therein are met to prevent potential exposure risks.

Cost: There would be a limited amount of capital or operating and maintenance cost for this alternative. Disposal costs could be moderate to high depending on how the excavated soils are characterized for disposal. Monitoring costs would be eliminated for TCE and PCE in the excavated area only. There would be additional costs associated with the continued operation and maintenance of TCE and PCE located below the building foot print.

307344

Time: Concentrations of TCE, PCE and Lead would be immediately reduced below clean-up goals in the excavated areas. Concentration of TCE and PCE would remain above cleanup levels under the foot print of the building.

6.1.1.4 Alternative 4: Soil Vapor Extraction with Limited Excavation and Off-Site Disposal, and Capping and Access and Use Restrictions

Alternative 4 is a combination of SVE with Limited Excavation and Off-Site Disposal with Access and Use Restrictions, and Capping. Under this alternative, SVE would be used to treat the TCE and PCE soil contamination present at Building 12. The PCE contaminated soil at Building 13 and the Lead contaminated soil area at Building 12 would be excavated and disposed off-site. Any TCE or PCE soil contamination potentially remaining above the RAOs after SVE is conducted would be capped with existing concrete or pavement. A Deed Notice would be filed with the appropriate authorities and interested parties identifying access and use restrictions associated with the contamination remaining.

SVE can be instituted with the least disruption of the established use of the Klockner Property. SVE is a cost effective process option that would achieve the remediation objective. SVE is a presumptive technology that is proven to be effective for solvents such as TCE and PCE.

SVE will remove some of the contamination; the residual contamination bound up in the less permeable soil (silty clay) will be addressed with a combination of Capping and Access and Use Restrictions as detailed under Alternatives 2 and 3.

Excavation and Off-site Disposal would be used to remediate the PCE contaminated soil present at the Building 13 Property and the Lead contaminated soil area located in the paved area near the Building 12 alleyway. These two areas are accessible for excavation with minimal disruption of the business operations at the site. The Lead contaminated soil present at the Building 12 Property and the PCE contaminated soil present at the Building 13 Property would be excavated and transported to off-site disposal facilities. The type of facility (hazardous, non hazardous, pretreatment required) that the excavated soils would be disposed of at would depend on how the waste is characterized.

The area that would be treated using SVE at the Building 12 Property covers approximately 18,900 square feet. The area that would be excavated at the Building 12 Property covers approximately 360 square feet and approximately 27 cubic yards of soil would be generated for off-site disposal. The area that would be excavated at the Building 13 Property covers approximately 800 square feet and approximately 150 cubic yards of soil would be generated for off-site disposal.

307345

Cost: There would be a low to moderate amount of capital or operating and maintenance cost for this alternative. Disposal costs would be low to moderate depending on how the excavated soils are characterized for disposal. Monitoring costs would be eliminated for TCE and PCE in the excavated area only. There would be additional costs associated with the continued operation and maintenance of TCE and PCE located below the building foot print.

Time: Concentrations of PCE and Lead would be immediately reduced below RAOs in the excavated areas. Concentrations of TCE and PCE would decrease significantly in the initial phase of the SVE operation. The period of time required to achieve the applicable RAOs would depend upon various factors. Additional evaluation and pilot study is necessary to determine when the applicable cleanup standard will be achieved under this alternative. Residual concentrations of TCE and PCE could remain above RAOs and would be addressed by Capping and Access and Use Restrictions.

7.0 CONCLUSION

This Second Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation has systematically evaluated all identified GRAs, remedial technologies and process options to arrive at the remedial alternatives for a comprehensive response to the Operable Unit #3 soil contamination. Six remedial technologies were retained through the screening process and included No Action, Access and Use Restrictions, Caps, Excavation, In-situ Treatment – Soil Vapor Extraction, and Off-site Disposal. These retained remedial technologies were then used to develop four remedial alternatives. The four remedial alternatives developed include:

- Alternative 1: No Action
- Alternative 2: Access and Use Restrictions, and Capping
- Alternative 3: Excavation and Off-Site Disposal with Capping and Access and Use Restrictions
- Alternative 4: Soil Vapor Extraction with Excavation and Off-Site Disposal, and Capping and Access and Use Restrictions

A detailed evaluation of the four remedial alternatives will be conducted under the Feasibility Study.

307346

8.0 REFERENCES

Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA Interim Final EPA/540/G-89/004 OSWER Directive 9355.3-01 October 1988

User Guide to the VOCs in Soils. Presumptive Remedy (EPA, 1996).EPA Document No. 540-F-96-008

Guide for Conducting Treatability Studies Under CERCLA: Soil Vapor Extraction Interim Guidance, EPA/540/2-91/019A September 1991

Feasibility Study analysis for CERCLA Municipal Landfill Sites, EPA 5540/R-94/081, August 1994

Federal Remediation Technologies Roundtable (FRTR), Remediation Technologies Screening Matrix & Reference Guide, Version 4.0

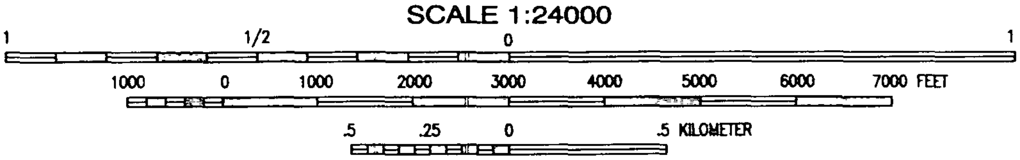
Environmental Security Technology Certification Program Impact of Landfill Closure Design on Long Term Attenuation of Chlorinated Hydrocarbons, March 2002

307347

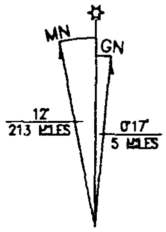
FIGURES

307348

SCALE 1:24000



307349

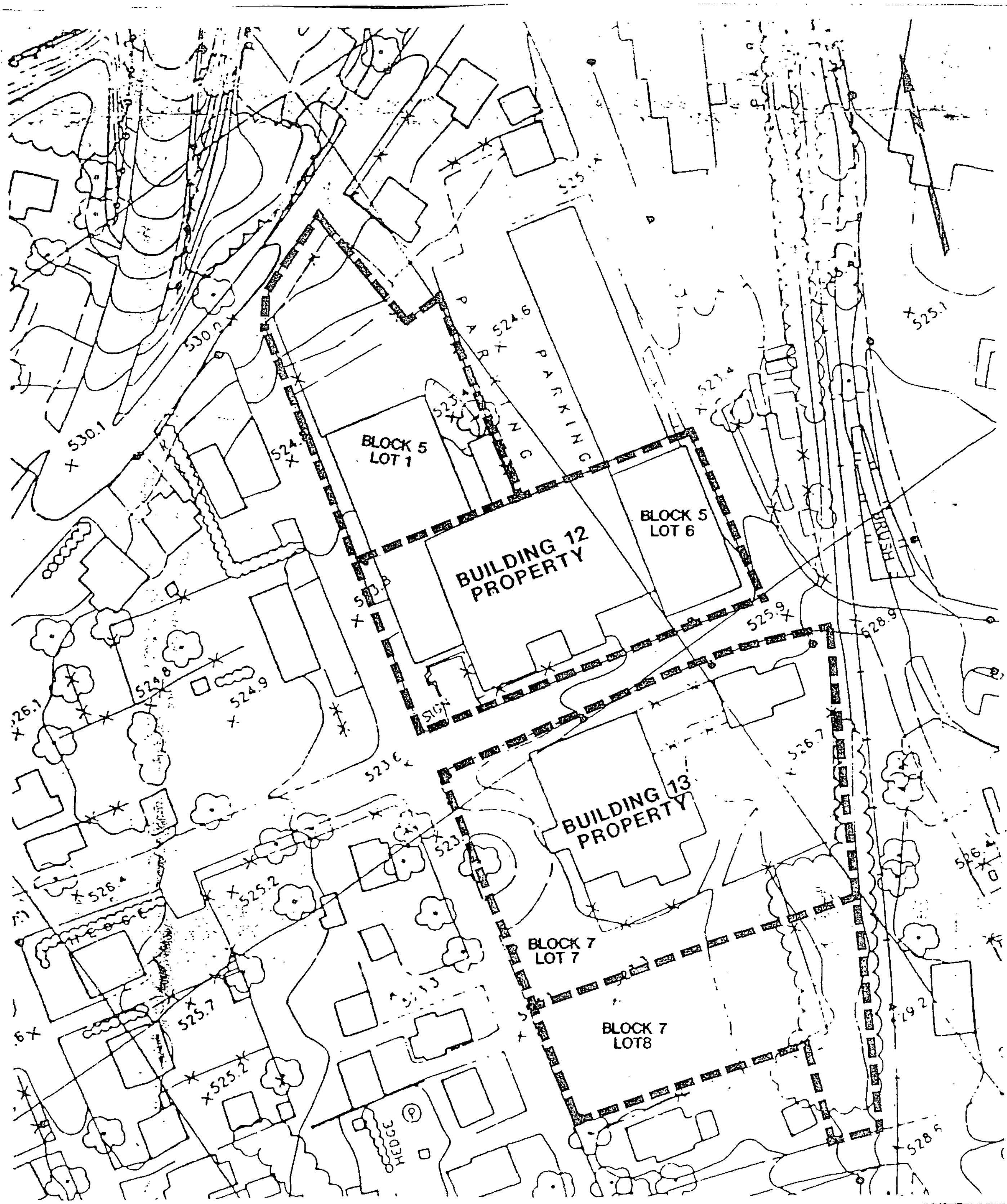


UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

QUADRANGLE LOCATION

THE WHITMAN CompanieS, INC.

KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY		
SITE LOCATION ON USGS DOVER, N.J. QUADRANGLE		
ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302MAP
CHECKED BY: M.M.	DATE: APRIL 2005	FIGURE NO: 1



SOURCE:

AERIAL SURVEY DATED JUNE 1994 PREPARED BY ROBINSON AERIAL SURVEY'S INC. FOR CONESTOGA-ROVERS & ASSOCIATES

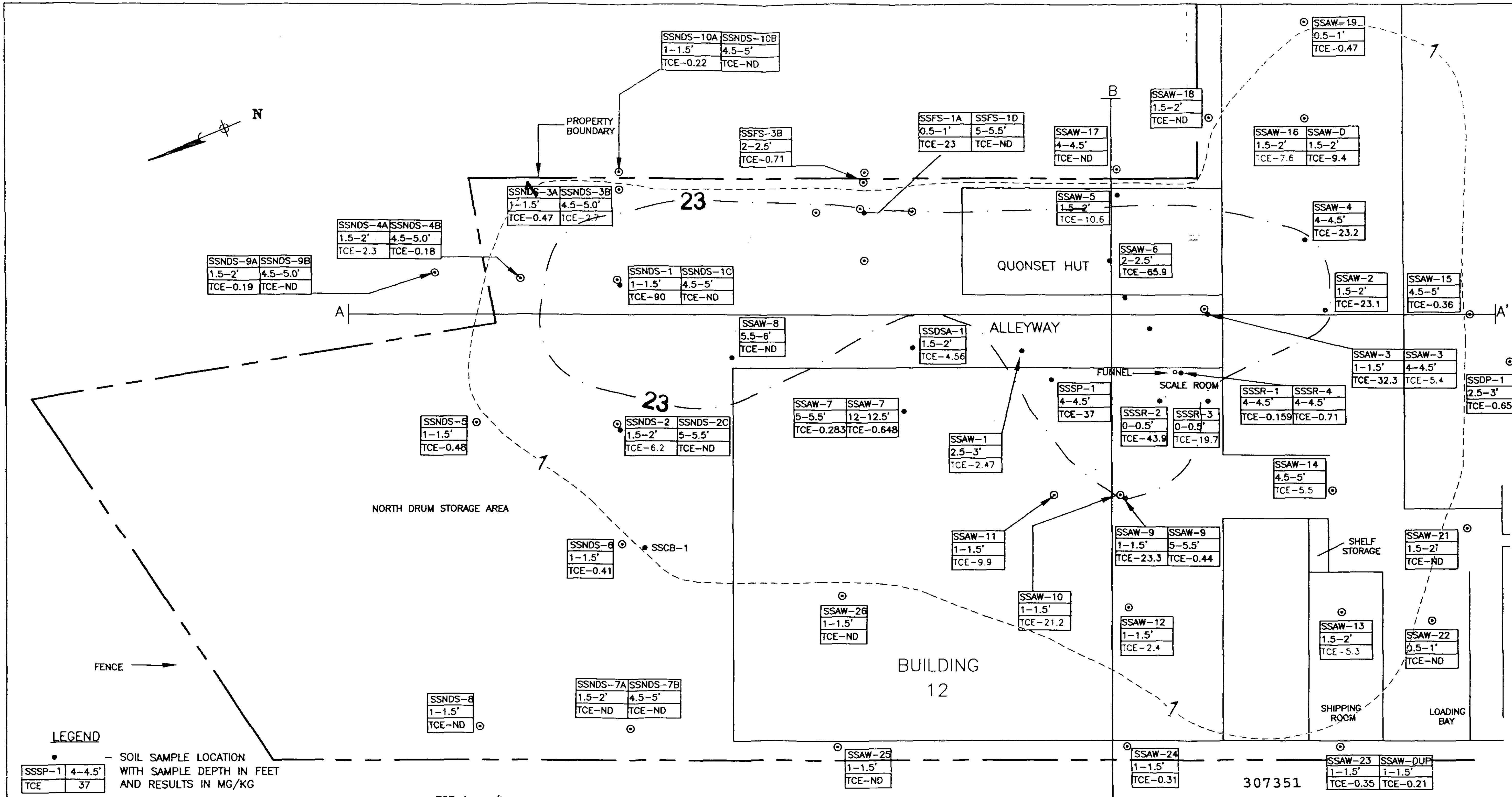
307350

THE WHITMAN CompanieS, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH
MORRIS COUNTY, NEW JERSEY

SITE MAP OF
KLOCKNER PROPERTY

ORIGINAL BY: L.Z.	DRAWN BY: R.R.	DRAWING NO: 950302X9
CHECKED BY: B.U.	DATE: FEB. 2005	FIGURE NO: 2



LEGEND

SSSP-1	4-4.5'
TCE	37

- • – SOIL SAMPLE LOCATION WITH SAMPLE DEPTH IN FEET AND RESULTS IN MG/KG
- • – SOIL SAMPLE LOCATION OCTOBER 1998
- ⊙ – SOIL SAMPLE LOCATION FEBRUARY/AUGUST 2000
- TCE – TRICHLOROETHYLENE
- ND – NOT DETECTED

NOTE: RESULTS IN BOLD EXCEED NJDEP IMPACT TO GROUND WATER SOIL CLEANUP CRITERIA OF 1 mg/kg FOR TCE.

- TCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)
- TCE 23 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)
- TCE-90 – TCE CONCENTRATION AT OR ABOVE 23 mg/kg
- TCE-3 – TCE CONCENTRATION ABOVE 1 mg/kg
- A——A' – CROSS SECTION LINE (SEE FIGURES 5 & 6)

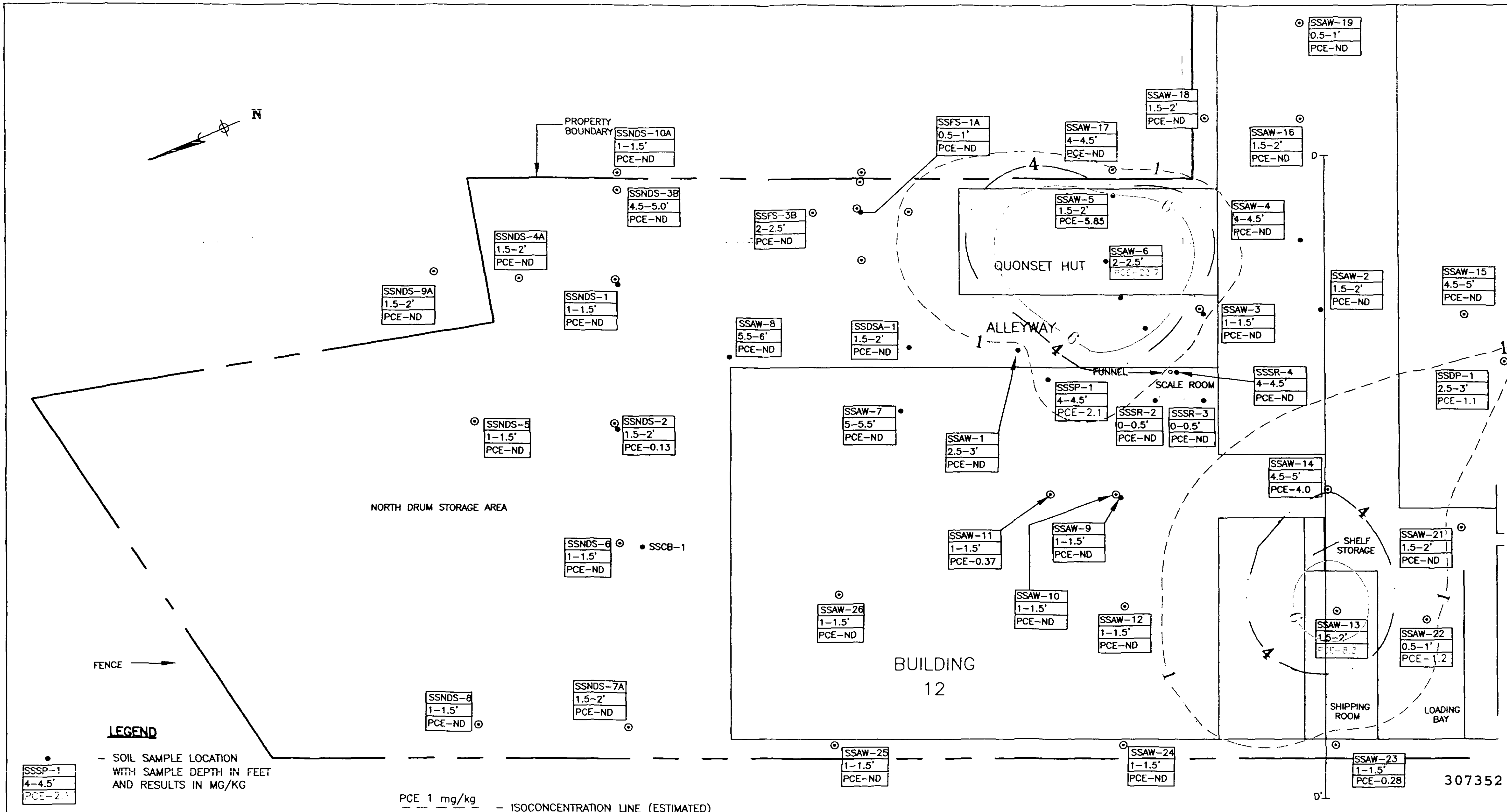
SCALE 0 20'

THE WHITMAN CompanieS, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH
MORRIS COUNTY, NJ

0-6 FOOT DEPTH SOIL SAMPLE RESULTS AND ISOPETH FOR TCE BUILDING 12

ORIG. BY: B.U.	DWG. BY: R.R.	CHK. BY: B.U.
DWG.#: 950302E7	DATE: FEB. 2005	FIGURE: 3



307352

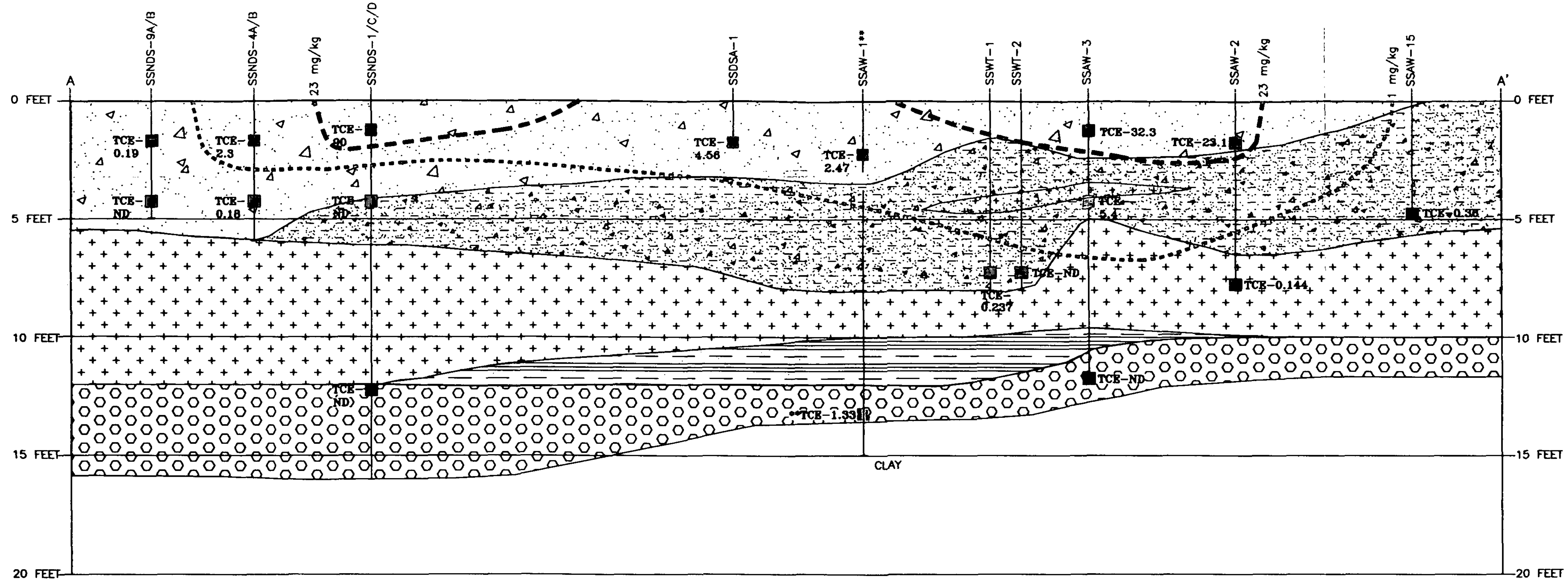
LEGEND

SSSP-1 / 4-4.5' / PCE-2.1	– SOIL SAMPLE LOCATION WITH SAMPLE DEPTH IN FEET AND RESULTS IN MG/KG
•	– SOIL SAMPLE LOCATION OCTOBER 1998
⊙	– SOIL SAMPLE LOCATION FEBRUARY/AUGUST 2000
PCE	– TETRACHLORETHYLENE
ND	– NOT DETECTED
PCE 1 mg/kg	– ISOCONCENTRATION LINE (ESTIMATED)
PCE 4 mg/kg	– ISOCONCENTRATION LINE (ESTIMATED)
PCE 6 mg/kg	– ISOCONCENTRATION LINE (ESTIMATED)
PCE-3	– PCE CONCENTRATION ABOVE 1 mg/kg
PCE-5	– PCE CONCENTRATION AT OR ABOVE 4 mg/kg
	– PCE CONCENTRATION AT OR ABOVE 6 mg/kg
D — D'	– CROSS SECTION LINE (SEE FIGURE 12)

NOTE:
RESULTS IN BOLD EXCEED NJDEP IMPACT TO GROUND WATER SOIL CLEANUP CRITERIA OF 1 mg/kg FOR PCE

SCALE
0 20'

THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NJ	
	0-6 FOOT DEPTH SOIL SAMPLE RESULTS AND ISOPETH FOR PCE BUILDING 12	
ORIG. BY: L.Z.	DWG. BY: R.R.	CHK. BY: L.Z.
DWG.#: 950302F2	DATE: FEB. 2005	FIGURE: 4



LEGEND

SSAW-3 — SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG

TCE-32.3

TCE 1 mg/kg — ISOCONCENTRATION LINE (ESTIMATED)

TCE 23 mg/kg — ISOCONCENTRATION LINE (ESTIMATED)

- SILTY SAND AND GRAVEL
- SILTY FINE SAND
- SILTY CLAY WITH SAND AND SOME GRAVEL
- SILTY CLAY WITH SAND
- MEDIUM SAND

NOTE:
SEE FIGURE 3 FOR CROSS SECTION LOCATION

TCE — TRICHLOROETHYLENE
ND — NOT DETECTED

307353

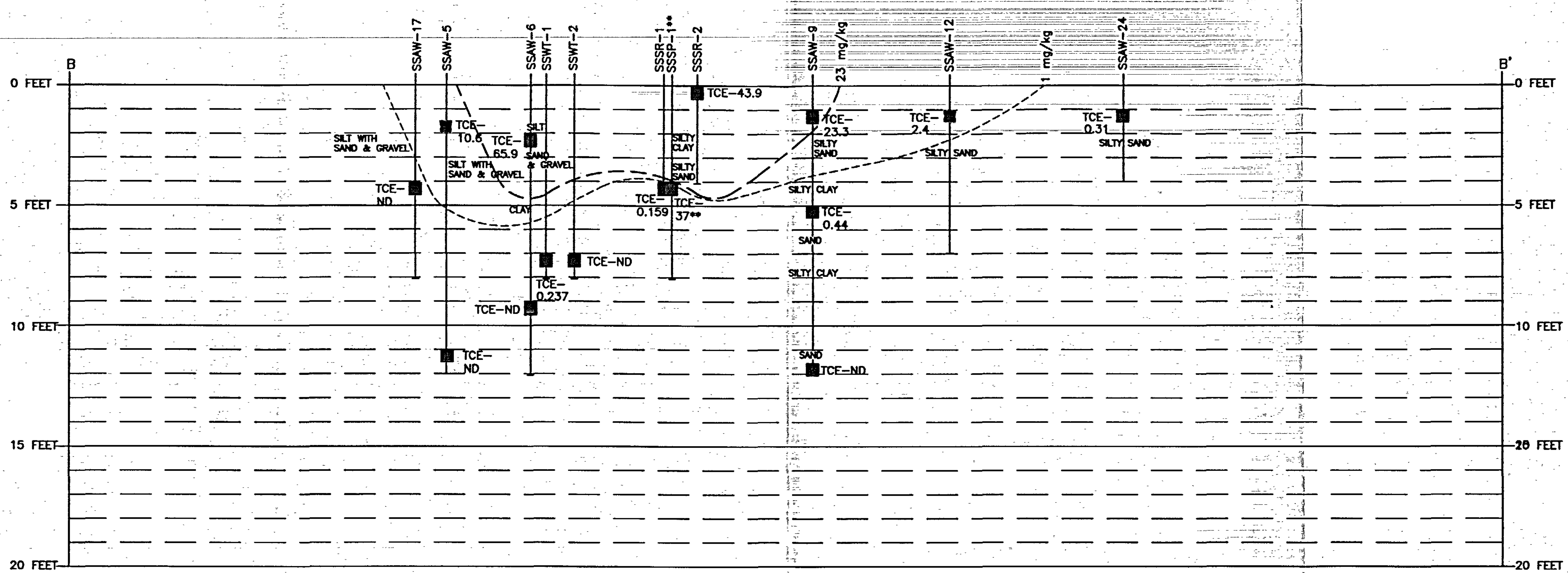
0 20'
HORIZONTAL SCALE

0 5'
VERTICAL SCALE

** — THE TCE RESULT FOR SAMPLE SSAW-1 WAS NOT USED IN THE PREPARATION OF THE ISOCONCENTRATION LINES. IT IS JUST ABOVE THE NEW JERSEY IMPACT TO GROUND WATER SOIL CLEANUP CRITERIA OF 1 MG/KG AND MAY BE THE RESULT OF CONTAMINANT DIFFUSION FROM THE GROUND WATER TO THE SOIL AT THE CAPILLARY ZONE.

THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY
	CROSS SECTION A-A' BUILDING 12 TCE RESULTS

ORIGINAL BY: C.C.	DRAWN BY: R.R.	DRAWING NO: 950302E8
CHECKED BY: M.M.	DATE: FEB. 2005	FIGURE NO: 5



LEGEND

SSAW-4 / TCE-23.2	– SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG	
TCE 1 mg/kg	– ISOCONCENTRATION LINE (ESTIMATED)	TCE – TRICHLOROETHYLENE
TCE 23 mg/kg	– ISOCONCENTRATION LINE (ESTIMATED)	ND – NOT DETECTED
TCE-90	– TCE CONCENTRATION AT OR ABOVE 23 mg/kg	
TCE-3	– TCE CONCENTRATION ABOVE 1 mg/kg	

HORIZONTAL SCALE: 0 – 20'

307354

VERTICAL SCALE: 0 – 5'

NOTES:

1. SEE FIGURE 3 FOR CROSS SECTION LOCATION

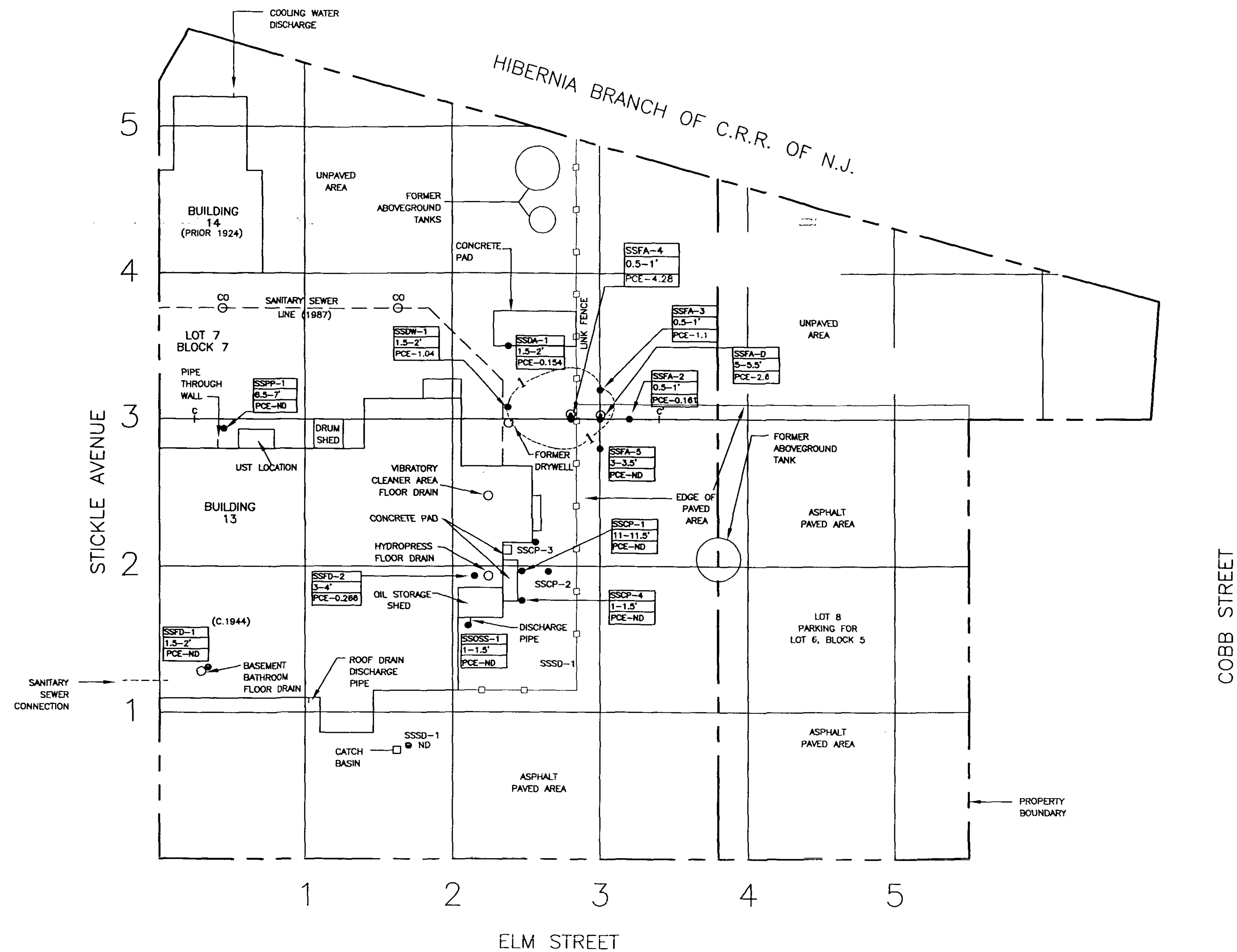
** – THE TCE RESULT FOR THE SAMPLE SSSP-1 WAS NOT USED IN THE PREPARATION OF THE ISOCONCENTRATION LINES BECAUSE THE SAMPLE WAS COLLECTED FROM BELOW THE INVERT OF A SUMP AND IS AN ANOMALY WITH RESPECT TO THE PREPARATION OF THE ISOCONCENTRATION LINES FOR THE AREA WIDE CONTAMINATION.

THE WHITMAN CompanieS, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH
MORRIS COUNTY, NEW JERSEY

CROSS SECTION B-B'
BUILDING 12-TCE RESULTS

ORIGINAL BY: C.C.	DRAWN BY: CLC	DRAWING NO: 950302C4
CHECKED BY: B.U.	DATE: FEB. 2005	FIGURE NO: 6



LEGEND

SSFA-4 4.28 0.5-1' — SOIL SAMPLE LOCATION RESULTS IN MG/KG SAMPLE DEPTH

TCE — TRICHLOROETHYLENE

PCE — TETRACHLOROETHYLENE

ND — NOT DETECTED

PCE 1 mg/kg — ISOCONCENTRATION LINE (ESTIMATED)

PCE-3 — PCE CONCENTRATION ABOVE 1 mg/kg

C C' — CROSS SECTION LINE (SEE FIGURE 8)

NOTE: RESULTS IN GREEN EXCEED NJDEP CRITERIA.

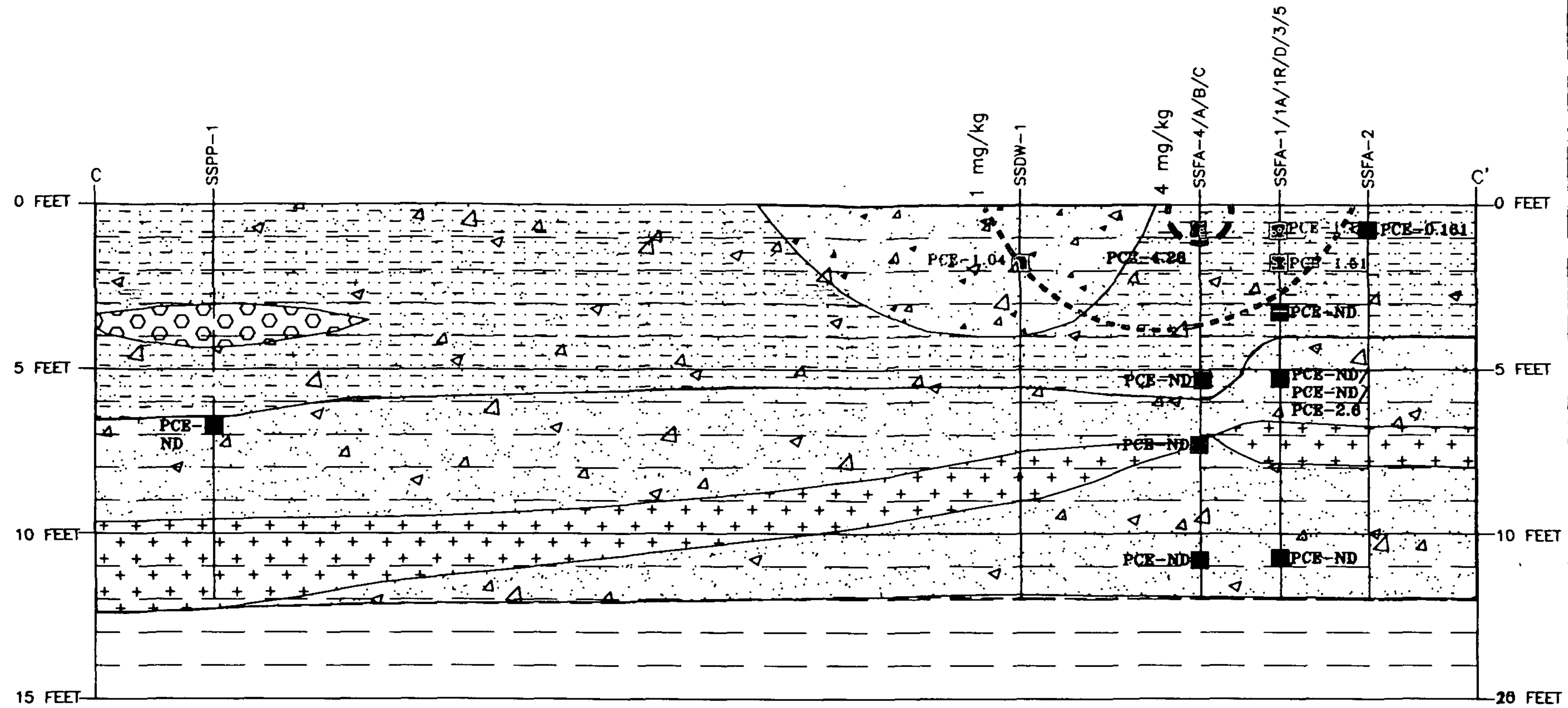
SCALE

0 40'

307355

THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NJ 0-6 FOOT SOIL SAMPLE RESULTS & ISOPLETH FOR PCE - BUILDING 13

ORIG. BY: B.U.	DWG. BY: R.R.	CHK. BY: B.U.
DWG.#: 950302F3	DATE: FEB. 2005	FIGURE: 7



LEGEND

SSFA-2 – SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG

PCE-0.161

PCE – TETRACHLOROETHYLENE

ND – NOT DETECTED

PCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE 4 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE-4.28 – PCE CONCENTRATION AT OR ABOVE 4 mg/kg

PCE-1.51 – PCE CONCENTRATION ABOVE 1 mg/kg

NOTE:
SEE FIGURE 7 FOR CROSS SECTION LOCATION

– SILTY SAND AND GRAVEL

– SILTY FINE SAND

– SILTY CLAY WITH SAND AND SOME GRAVEL

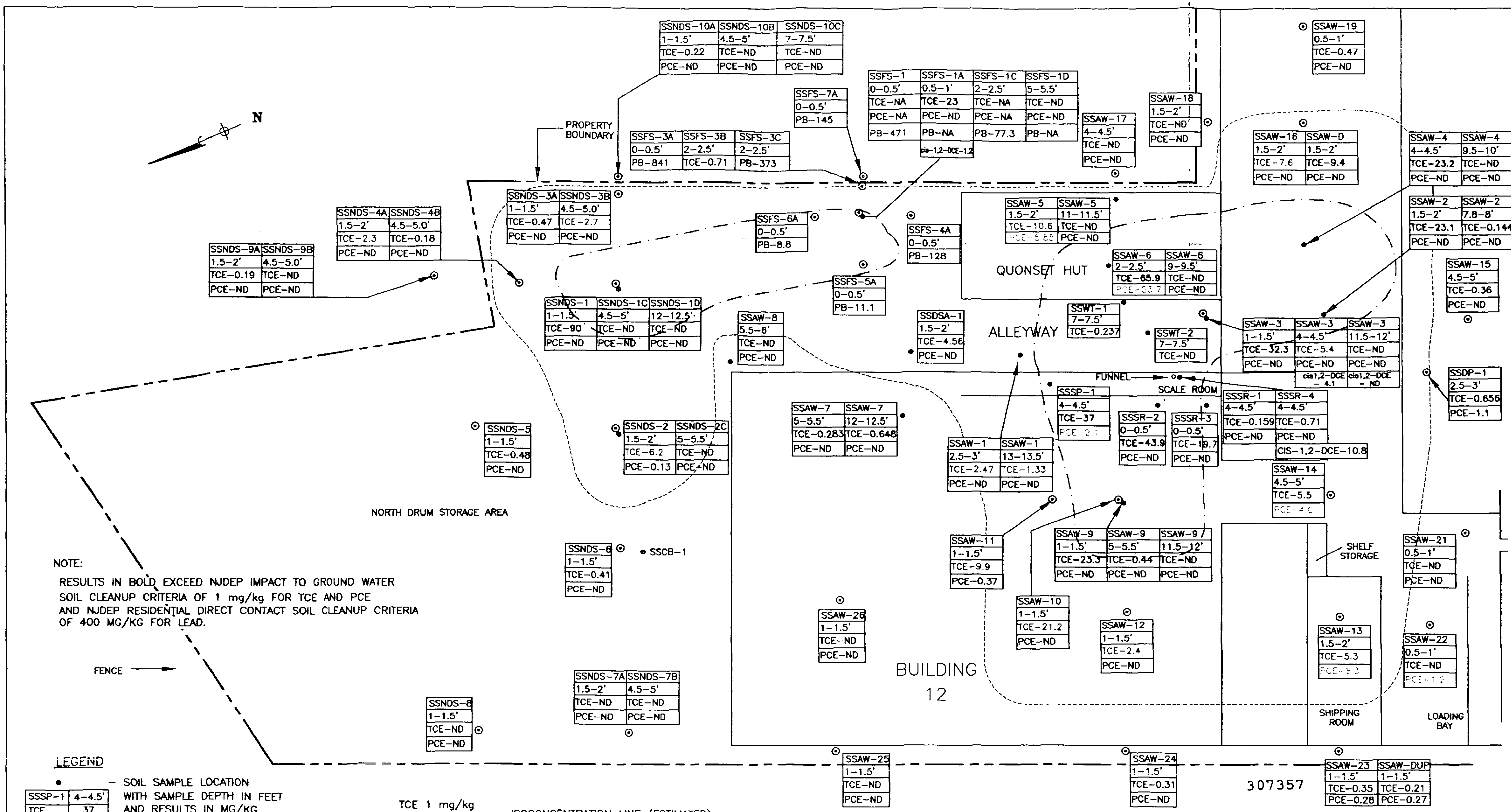
– GRAVEL

0 20'
HORIZONTAL SCALE

0 5'
VERTICAL SCALE

307356

THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY	
	CROSS SECTION C–C' BUILDING 13	
ORIGINAL BY: C.C.	DRAWN BY: CLC	DRAWING NO: 950302E5
CHECKED BY: M.M.	DATE: AUGUST 2004	FIGURE NO: 8



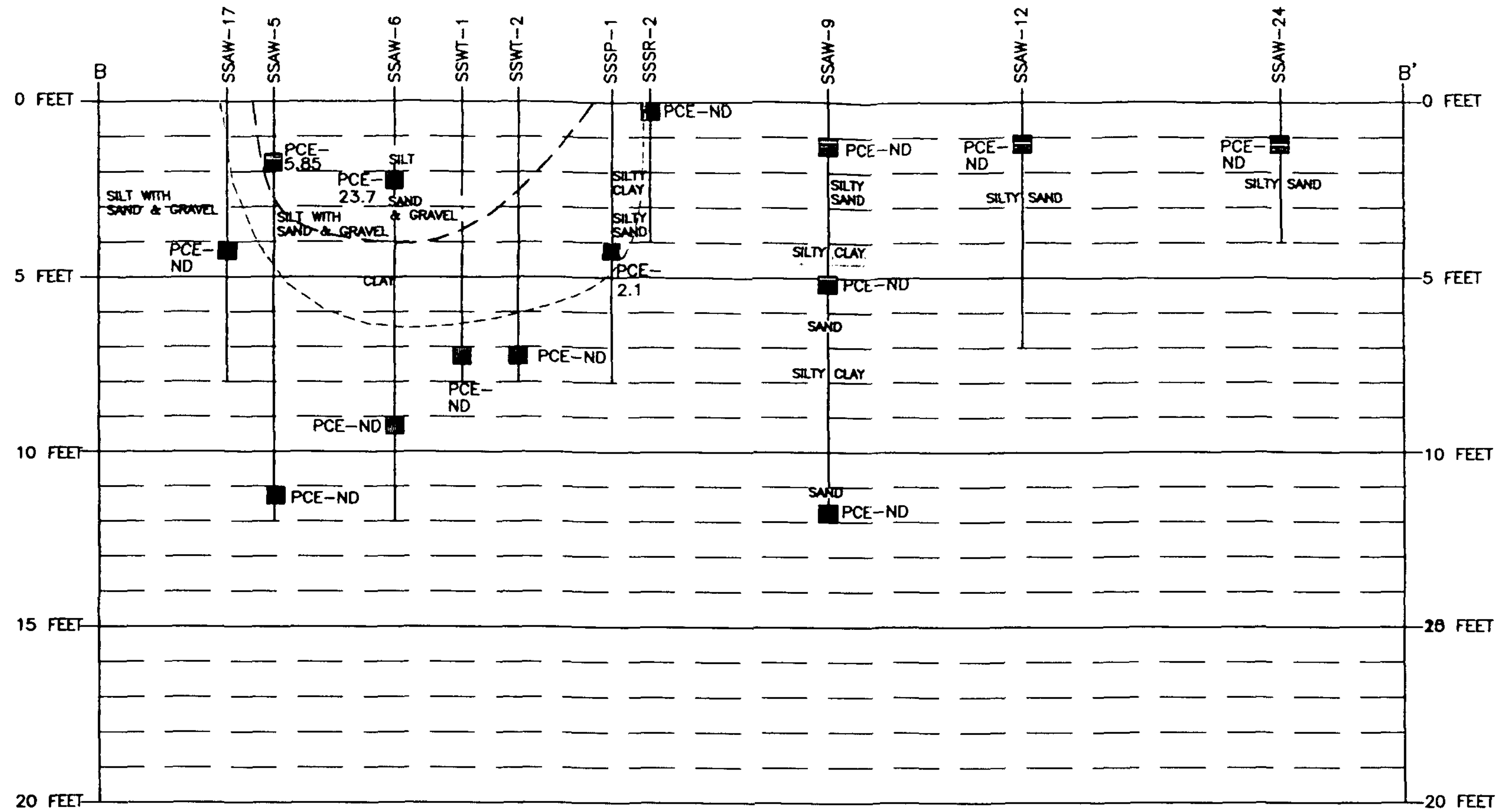
LEGEND

- • – SOIL SAMPLE LOCATION
- SSSP-1 4-4.5' / TCE 37 – WITH SAMPLE DEPTH IN FEET AND RESULTS IN MG/KG
- • – SOIL SAMPLE LOCATION OCTOBER 1998
- ⊙ – SOIL SAMPLE LOCATION FEBRUARY/AUGUST 2000
- TCE – TRICHLOROETHYLENE
- PCE – TETRACHLORETHYLENE
- PB – LEAD
- CIS-1,2-DCE – CIS-1,2-DICHLOROETHENE
- ND – NOT DETECTED
- TCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)
- TCE 23 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)
- TCE-90 – TCE CONCENTRATION AT OR ABOVE 23 mg/kg
- TCE-3 – TCE CONCENTRATION ABOVE 1 mg/kg
- PB-450 – PB CONCENTRATION ABOVE 400 mg/kg
- PCE-3 – PCE CONCENTRATION ABOVE 1 mg/kg

NOTE:
ONLY RESULTS FOR TCE, PCE, AND PB ARE PLOTTED.
CIS-1,2-DCE INCLUDED WHERE CONCENTRATION EXCEEDS 1 mg/kg

SCALE
0 20'

THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NJ	
	SOIL SAMPLE RESULTS AND SAMPLE LOCATIONS BUILDING 12	
ORIG. BY: M.M.	DWG. BY: R.R.	CHK. BY: B.U.
DWG.#: 950302F4	DATE: FEB. 2005	FIGURE: 9



307358

LEGEND

SSAW-5 PCE-5.85 – SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG

PCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE 4 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE-23.7 – PCE CONCENTRATION AT OR ABOVE 4 mg/kg

PCE-2.1 – PCE CONCENTRATION ABOVE 1 mg/kg

PCE – TETRACHLOROETHYLENE

ND – NOT DETECTED

0 20'

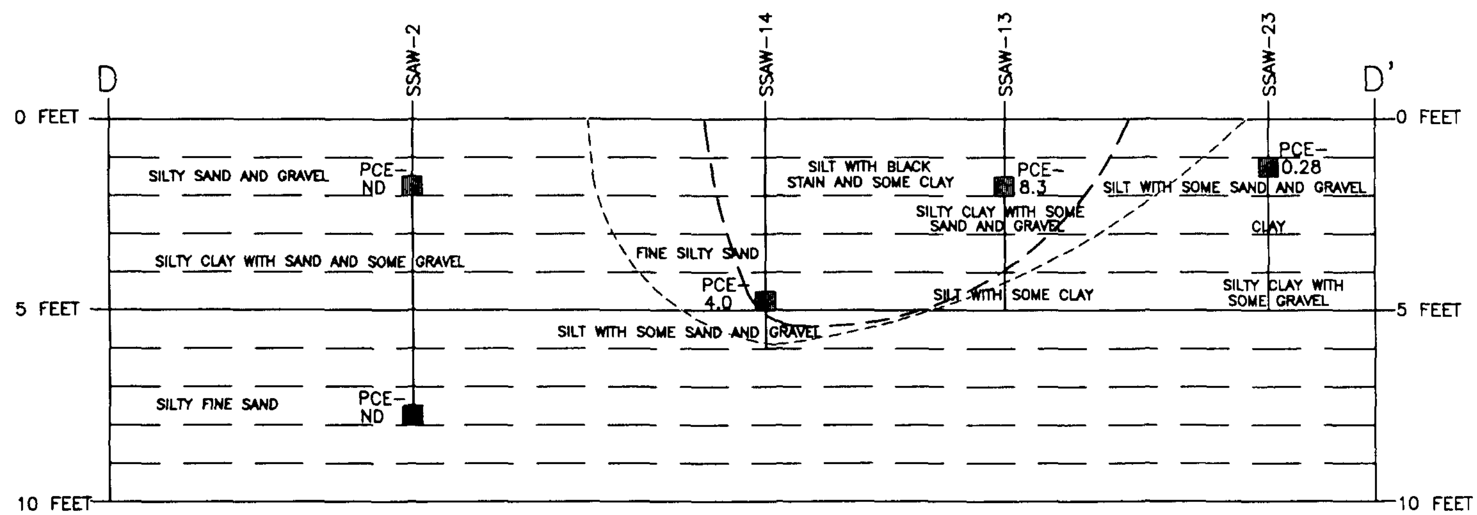
HORIZONTAL SCALE

0 5'

VERTICAL SCALE

NOTE: SEE FIGURE 3 FOR CROSS SECTION LOCATION

THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY CROSS SECTION B–B' BUILDING 12 — PCE RESULTS		
ORIGINAL BY: L.Z.	DRAWN BY: R.R.	DRAWING NO: 950302F5	
CHECKED BY: L.Z.	DATE: FEBRUARY 2005	FIGURE NO: 10	



LEGEND

PCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE 4 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE-8.3 – PCE CONCENTRATION AT OR ABOVE 4 mg/kg

PCE – TETRACHLOROETHYLENE

ND – NOT DETECTED

SSAW-23 PCE-0.28 – SOIL SAMPLE LOCATION WITH RESULTS IN MG/KG

NOTE: SEE FIGURE 4 FOR CROSS SECTION LOCATION

VERTICAL SCALE
0 5'

HORIZONTAL SCALE
0 20'

307359

THE WHITMAN CompanieS, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH
MORRIS COUNTY, NEW JERSEY

CROSS SECTION D-D'
BUILDING 12 – PCE RESULTS

ORIGINAL BY: L.Z.	DRAWN BY: R.R.	DRAWING NO: 950302F1
CHECKED BY: L.Z.	DATE: FEBRUARY 2005	FIGURE NO: 11

ATTACHMENTS

307360

ATTACHMENT 1

EPA'S SEPTEMBER 14, 2005 LETTER

307361

THE
WHITMAN
COMPANIES, INC.

Klockner Whitman

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
290 BROADWAY
NEW YORK, NEW YORK 10007

SEP 14 2005

RECEIVED
SEP 15 2005
The Whitman Companies, Inc.

EXPRESS MAIL
RETURN RECEIPT REQUESTED

Mr. Michael Metlitz
116 Tices Lane
Unit B-1
East Brunswick, New Jersey 08816

Re: First Amended Technical Memorandum for the Development and Screening of Alternatives for Site Remediation for the Rockaway Borough Wellfield Superfund Site, Morris County, New Jersey

Dear Mr. Metlitz:

The U.S. Environmental Protection Agency (EPA) and New Jersey Department of Environmental Protection (NJDEP) have reviewed the Whitman Companies' March 2005 First Amended Technical Memorandum for the Development and Screening of Alternatives for Site Remediation for the Klockner and Klockner portion of the Rockaway Borough Wellfield site. Please address the enclosed NJDEP comments as well as the following EPA comments.

General Comments

The First Amended Technical Memorandum is more consistent with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements, however, a major inconsistency is that the alternatives screening process does not follow the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, October 1988. In particular, technology/process option screening is supposed to be performed first to eliminate technically infeasible technologies/process options, followed by evaluation based on effectiveness , implementability and cost to select the best process options for alternative development. The following paragraph provides an example of how the organization of the First Amended Technical Memorandum does not follow the Guidance.

The evaluation of process options (i.e., for effectiveness, implementability, and cost) was performed in Table 2, but does not appear to have been used to select the best process options for alternative development. Instead, Section 6 includes an evaluation of the process options against the nine evaluation criteria developed to address CERCLA requirements, which were used to select process options for alternative development. This is not in accordance with the Guidance, which calls for process options to be evaluated for effectiveness, implementability and cost to select the best option, and appears to be an extra step.

The title of Section 6, "Initial Screening of Process Options" seems inappropriate, as the "initial screening" discussed in the Guidance is for technical feasibility of process options. This section would be more appropriately titled "Evaluation of Process Options."

307362

The specific depth to the saturated zone should be stated as previously requested in the January 20, 2005 EPA comment letter, Comment 2.

A figure should be included that incorporates the depth to groundwater information in Attachment 1 to delineate the depth to groundwater. This will clearly define the source area remediation from the groundwater remediation, which will be conducted by Alliant Techsystems, Inc.

Specific Comments

1. **Table 2** - On-site incineration, on-site thermal desorption and on-site aeration are included as process options under the General Response Actions. These process options should be identified as Treatment Technologies on Table 2.

2. **Section 5.3.1.4** - Please explain why the data identified would be needed for the No Action alternative.

3. **Section 5.3.4.3** - This paragraph indicates that capping does not lessen mobility of contaminants, but does mitigate migration. This appears contradictory. Section 7.1.1.2.3 also indicates that capping as an engineering control prevents migration of the contaminant.

4. **Section 5.3.5.2** - The last sentence of this paragraph does not appear to be a complete sentence.

5. **Section 5.3.5.3** - The last bullet should specifically indicate the accessibility limitation (i.e., contaminated soil is beneath an active structure).

6. **Section 5.3.7.7** - In the second sentence, "sight" should be "Site".

7. **Section 5.3.10.2** - The first sentence indicates that inorganics are the target contaminants for oxidation/reduction, but the text includes discussion of its applicability for PCE/TCE. This seems contradictory.

8. **Section 6.0** - The Guidance is a guidance document, not a "rule" as indicated.

9. **Table 4** - This table should be titled "Evaluation of Process Options", not "Screening and Elimination of Process Options." As discussed above, the screening of technologies/process options is supposed to be an assessment of the technical feasibility of each process option, and is performed to eliminate technically infeasible technologies before the evaluation step. The evaluation follows and the "best" process option is selected from among those that are technically feasible for incorporation into remedial alternatives. Table 4 as presented in the First Amended Technical Memorandum provides an evaluation of the process options against the nine CERCLA evaluation criteria, which is not required according to the Guidance. Only developed alternatives that pass initial screening need be evaluated against these criteria. Table 4 should only include an evaluation of the process options against effectiveness, implementability and cost evaluation criteria.

   The evaluations in Table 4 are not presented consistently. For example, under long-term effectiveness, some process options have yes/no evaluations, while others have moderate/high evaluations. Similarly, under cost effectiveness, the evaluations are noted as: yes, cost effective and low/moderate/high cost.

At this stage of the Feasibility Study, State and Community Acceptance cannot be assessed, as these criteria can only be evaluated when the FS is presented to the State and Public for review and comment.

10. **Table 5** - The evaluations are not consistent, see Comment 9.

    In the implementability column, change "indeded" to "intended" for capping w/muliti-media cap and phytoremediation.

11. **Section 7.1** - The second paragraph should read Operable Unit #3.

12. **Section 7.1.1.2.1** - The second paragraph, last sentence states that "... vertical migration of the contaminants to the groundwater will be prevented." This should be changed to reduced, minimized, etc., as capping will not necessarily prevent vertical migration.

13. **Section 7.1.1.3** - Alternative 3 should not be developed for PCE/TCE , as (full) excavation was screened out in Table 4.

14. **Section 7.1.1.4** - The first paragraph, last sentence should read "outside the foot print...". Second paragraph should have a period at the end.

15. **Section 7.1.1.5** - The description of the lead removal should be moved to the lead alternatives, Section 7.1.2 on Page 43.

16. **Section 7.1.2** - The lead alternatives should be numbered and distinguishable from the PCE/TCE alternatives.

17. **Section 8.0** - The No Action alternative cannot be eliminated and must be carried through detailed evaluation; therefore, only one alternative (i.e., Alternative 3) was eliminated (and that one should not have been developed based on the screening).

    Sections 5.0 and 6.0 do not include discussions of remedial alternatives; therefore, the last sentence of the first paragraph is incorrect.

In accordance with Section VIII, paragraph 35 of the Administrative Order on Consent, an amended Technical Memorandum is due 30 days after receipt of this letter.

Should you have any questions or comments on any of the above, please contact Brian Quinn, of my staff, at 212-637-4381.

Sincerely yours,

Carole Petersen, Chief
New Jersey Remediation Branch

Enclosure

cc: David L. Isabel, Riker, Danzig, Scherer, Hyland & Perretti, w/encl.
Donna Gaffigan, NJDEP, w/encl.

State of New Jersey

Richard J. Codey
Acting Governor

Department of Environmental Protection

Bradley M. Campbell
Commissioner

July 25, 2005

Brian Quinn, Project Manager
USEPA, Region II
NJ Remedial Branch
290 Broadway, 19th Floor
New York, NY 10007-1866

Re: First Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation for Operable Unit #3
Rockaway Borough Well Field Site
Rockaway Borough, Morris County

Dear Mr. Quinn,

The New Jersey Department of Environmental Protection (NJDEP) is in receipt of the First Amended Technical Memorandum for Development and Screening of Alternatives for Site Remediation for Rockaway Borough Well Field Site, Operable Unit #3 dated March 2005. The document was prepared by The Whitman Companies, Inc. on behalf of Klockner & Klockner. The information presented in this Technical Memorandum will be used as the basis for the feasibility study.

Upon review NJDEP has the following comments.

1. Section 1.0 Introduction, page 1

   a) The document does not follow the process for developing remedial alternatives as described in EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.

   b) It is NJDEP's opinion that the Technical Memorandum should include the following steps leading up to the feasibility study:

      - Develop Remedial Action Objectives (Section 4.2.1 of Guidance)
      - Develop General Response Actions (Section 4.2.2 of Guidance)
      - Identify Volumes or Areas of Media (Section 4.2.3 of Guidance)
      - Identify and Screen Remedial Technologies and Process Options (Section 4.2.4 of Guidance)
      - Evaluate Process Options for effectiveness, implementability and cost (Section 4.2.5 of Guidance)
      - Assemble Alternatives (Section 4.2.6 of Guidance)

   The detailed analysis of alternatives can wait for the Feasibility Study

307365

2. Section 1.1 Purpose of this Report, page 1

   This section should more closely reflect the Guidance.

3. Section 2.2 Site History, page 4

   This section should be revised to state that the ground water contamination is currently being addressed by Alliant Techsystems Inc., not by Cordant Technologies, Inc.

4. Section 4.0 Development of Remedial Action Objectives, pages 4-8

   a) The Remedial Action Objectives were not identified and should be.

   b) One objective should be to remediate the volatile organic compound contamination in soil to achieve the New Jersey Impact to Ground Water Soil Cleanup Criteria (NJIGWSCC) to remove the continuing source of ground water contamination.

   c) Another objective should be to remediate the lead contamination in the soil to achieve the New Jersey Residential Direct Contact Soil Cleanup Criteria (NJRDCSCC) to remove direct contact exposure.

5. Section 4.1.2 Cleanup Criteria, page 6

   a) The second full paragraph should clarify that NJDEP requires the remediation of soil contamination that exceeds the unrestricted use criteria, which is defined as the lowest of any numeric standard, without limitation, any residential soil remediation standard, any non-residential soil remediation standard and any applicable impact-to-groundwater soil standard.

   b) Table 1 includes a "Federal Standard (EPA)" for lead. The source of Federal Standards should be discussed in this section, as were the New Jersey Soil Cleanup Criteria (NJSCC).

   c) This section should provide an explanation of how the "Proposed Cleanup Concentration" for lead was selected.

   d) Why is the term "Proposed Cleanup Concentration" used in Table 1 instead of Applicable or Relevant and Appropriate Requirements (ARAR) or criteria to be considered (TBC) for the contaminants of concern? The preceding paragraphs discuss ARARs and TBCs for the Klockner & Klockner Property so this new term is confusing.

   e) Based on the conclusion of the RI Report and New Jersey regulations, NJIGWSCC must be considered to be an ARARs or TBCs for the volatile organic compound contamination in the soil. Since the limited extent of lead contamination in the soil does not appear to be impacting the ground water, the NJRDCSCC must be considered to be an ARAR or TBC.

307366

6. Section 4.2 Media to Which Remedial Action Applies, page 6

   This section should be revised to state that the ground water contamination is currently being addressed by Alliant Techsystems Inc. not by Cordant Technologies, Inc.

7. Section 4.3 Identification of Volumes or Areas of Media, pages 7-8

   a) This section must consistently describe the extent of contamination in terms of ARARs or TBCs, or even Proposed Cleanup Concentrations, otherwise the purpose of Table 1 is questionable. For example in one paragraph it is stated that the contamination exceeds the NJSCC, another states it exceeds NJIGWSCC, and another includes both the NJIGWSCC and NJRDCSCC.

   b) The volumes/areas of contaminated soil should play a role in the descriptions and screening of the remedial technologies and process options. For example, since there is a very limited amount contaminated soil, there is no need to include discussion of capping large areas of contamination as is stated in Section 5.3.4.2.

8. Section 5.1 Introduction, page 8

   This purpose of this section is to identify technologies and/or techniques capable of achieving the "remedial action objectives," but these objectives have not been identified.

9. Section 5.2.1 Remedial Technologies and Process Options for TCE and PCE, page 9

   a) Items 1 through 4 do not match the information provided in Table 2. The table includes General Response Actions, Remedial Technologies and Process Options but these are not defined or explained in the text. These categories should be defined in the text. Also, the individual Actions, Technologies and Options that are evaluated should be described briefly in the text (using an abbreviated form of the information that is presented in Section 5.3). Tables for this section should look like Figure 4-4 of the Guidance (i.e., should not include effectiveness, implementability, and cost).

   b) The two chemical treatment options should be included in Item 3 (In-Situ Treatment).

10. Section 5.2.2 Remedial Technologies and Process Options for Lead, page 10

    As discussed in Comment 9a, this section needs brief descriptions of the General Response Actions, Remedial Technologies and Process Options applicable for lead. Tables for this section should look like Figure 4-4 in the Guidance (i.e., should not include effectiveness, implementability, and cost).

11. Tables 2 and 3, pages 12-14

    The Effectiveness columns state that of some of the General Response Actions "do not achieve remedial action objectives." As stated above, the remedial action objectives were not identified so it is impossible to determine whether or not they are achieved by the action.

The document must be revised to include the remedial action objectives and the tables revised accordingly.

12. Section 5.3 Description of Seriously Considered Remedial Technologies pages 15-33

    a) This section should evaluate the process options for effectiveness, implementability and cost and include modified versions of Tables 2 and 3 that more accurately reflect the discussion in Section 5.2.

    b) As a general comment for this section, the descriptions of all the different remedial technologies should be abbreviated with the irrelevant information removed, and moved to Sections 5.2.1 and 5.2.2. The remedial technologies that are described should match those that are presented in Tables 2 and 3 for the different contaminants. More specific comments follow.

13. Section 5.3.1.3 No Action - Limitations, page 16

    This section should state that the volatile organic compounds present in the soil would remain a continuing source of ground water contamination. The phase "Although unlikely" must be removed from the sentence describing possible exposures.

14. Section 5.3.2.3 Monitored Natural Attenuation - Limitations, page 17

    The discussion of lead must be removed because MNA was not considered to be a remedial technology for lead.

15. Section 5.3.4.2 Capping/Containment – Applicability, page 18

    a) Remove the sentence stating that "caps may be applied to contaminated soil that is so large that other treatment is impractical." Replace it with a statement that caps prevent direct contact with contaminated soil and prevent vapor intrusion, as well as to minimize surface water infiltration through the contaminated soil.

    b) The discussion should also include other containment options such as vertical barriers that would prevent the horizontal flow of water (i.e., perched) through the contaminated soil.

16. Section 5.3.4.3 Capping/Containment - Limitations, page 19

    Add language stating that caps prevent direct contact with contaminated soil.

17. Section 5.3.4.5 Capping/Containment – Performance Data, page 19

    Remove the statement that containment is performed when extensive subsurface contamination precludes excavation because of unrealistic costs.

307368

18. Section 5.3.5.1 Excavation, Retrieval and Off-Site Disposal, Description, page 20

    The second paragraph is irrelevant because the previous paragraph states that a permitted disposal facility will be used.

19. Section 5.3.5.2 Excavation, Retrieval and Off-Site Disposal, Applicability, page 20

    The last sentence does not make sense and must be removed.

20. Section 5.3.5.5 Excavation, Retrieval and Off-Site Disposal, Performance Data, pg 21

    a) The second sentence is irrelevant and must be removed.

    b) The second paragraph should be revised to include the potential disposal of solid waste, because the contaminated soil from the site is not likely to be categorized as hazardous waste.

21. Section 5.3.5.6 Excavation, Retrieval and Off-Site Disposal, Cost, page 21

    The cost should also include disposal at a solid waste facility because the contaminated soil from the site is not likely to be categorized as hazardous waste.

22. Section 5.3.6 Soil Vapor Extraction, page 22

    The last sentence on this page states that the duration of operation and maintenance for in situ SVE is typically 1-3 years. This contradicts Table 2 that states that SVE is a slow process. This discrepancy must be resolved.

23. Section 5.3.6.1 Soil Vapor Extraction - Applicability, page 23

    The discussion of lead must be removed because SVE was not considered to be a remedial technology for lead.

24. Section 5.3.6.5 Soil Vapor Extraction - Cost, page 24

    The options for possible off-gas treatment of the recovered vapors must be discussed somewhere in the document.

25. Sections 5.3.9.2, 5.3.9.3, 5.3.9.4 and 5.3.9.5, Phytoremediation, page 30

    These sections do not correspond with the phytoremediation process option (Grow poplar trees) in Tables 2 and 3. These sections should be removed or the Tables revised, or both.

26. Section 6.0 Initial Screening of Process Options, page 34

    a) The purpose of Tables 4 and 5 are unclear as they do not comply with the Guidance. These tables should look like Table 4.5 of the Guidance.

b) If Table 4 is retained, then it must be revised to clarify why "partial excavation" and "excavation with off-site disposal" are both listed. Partial excavation did not appear previously, and excavation with off-site disposal should not yet be screened out for small area of the PCE contamination at Building 13. One of the remedial alternatives developed through this entire screening process should be partial excavation (for Building 13 PCE and lead) with off-site disposal.

27. Section 7.0 Detailed Analysis of Alternatives, page 38

a) This section should describe the Remedial Alternatives that were assembled from the Remedial Technologies and Process Options that passed the preliminary screening process. The assembled Remedial Alternatives must address both the volatile organic compound and lead contamination. This section must be revised to simply describe the Alternatives. The detailed analysis of the remedial alternative should take place in the feasibility study.

b) The No Action Alternative must be retained.

28. Section 8.0 Conclusion, pages 45-46

The conclusion should simply identify the remedial alternatives for the site, and explain that the detailed analysis of the alternative will be conducted in the Feasibility Study. It should not eliminate any of the alternatives, especially not the No Action Alternative. If this information is provided in Section 7.0, then Section 8.0 can be removed entirely.

If you have any questions regarding this letter, please contact me at (609) 633-1494.

Sincerely,

Donna L Gaffigan

Donna L. Gaffigan, Case Manager
Bureau of Case Management

C: Kathleen Kunze, BEERA

307370

ATTACHMENT 2

DEPTH TO GROUND WATER INFORMATION

307371

THE
WHITMAN
COMPANIES, INC.

TABLE 1

KLOCKNER & KLOCKNER

SHALLOW GROUND WATER ELEVATIONS MEASURED BY KLOCKNER'S CONSULTANTS

Monitoring Well	Top of Casing (feet, MSL)	Ground Surface Elevation (feet, MSL)	8/7/87		9/29/87		12/14/88		9/27/89		10/26/89		11/13/89		Range (feet)	Fluctuation (feet)
			Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)		
MW-1S	523.40	523.8	510.19	13.61	510.51	13.29	509.38	14.42	511.03	12.77	511.54	12.26	511.48	12.32	12.26-14.42	2.16
MW-2S	525.29	523.0	510.46	12.54	510.78	12.22	509.54	13.46	511.26	11.74	511.58	11.42	511.61	11.39	11.39-13.46	2.04
MW-3S	524.71	523.2	510.51	12.69	510.80	12.40	509.59	13.61	511.29	11.91	511.66	11.54	511.63	11.57	11.54-13.61	2.07
MW-4S	522.63	523.0	-	-	-	-	-	-	511.95	11.05	511.69	11.31	511.69	11.31	11.05-11.31	0.26
MW-5S	522.86	523.2	-	-	-	-	509.69	13.51	511.24	11.96	511.72	11.48	511.64	11.56	11.48-13.51	2.03
MW-6S	522.45	522.6	-	-	-	-	509.74	12.86	511.21	11.39	511.72	10.88	511.64	10.96	10.88-12.86	1.98
MW-7S	522.87	523.4	-	-	-	-	-	-	511.33	12.07	511.63	11.77	511.57	11.83	11.77-12.07	0.3
P-1	525.35	522.8	-	-	-	-	-	-	511.29	11.51	511.55	11.25	511.58	11.22	11.22-11.51	0.29

<u>Key</u>

MSL - Mean Sea Level

Note: All wells listed are located on the Building 12 property.

307372

F:\WPDOCS\MISC\950302.622

TABLE 2

KLOCKNER & KLOCKNER

SHALLOW GROUND WATER ELEVATIONS *

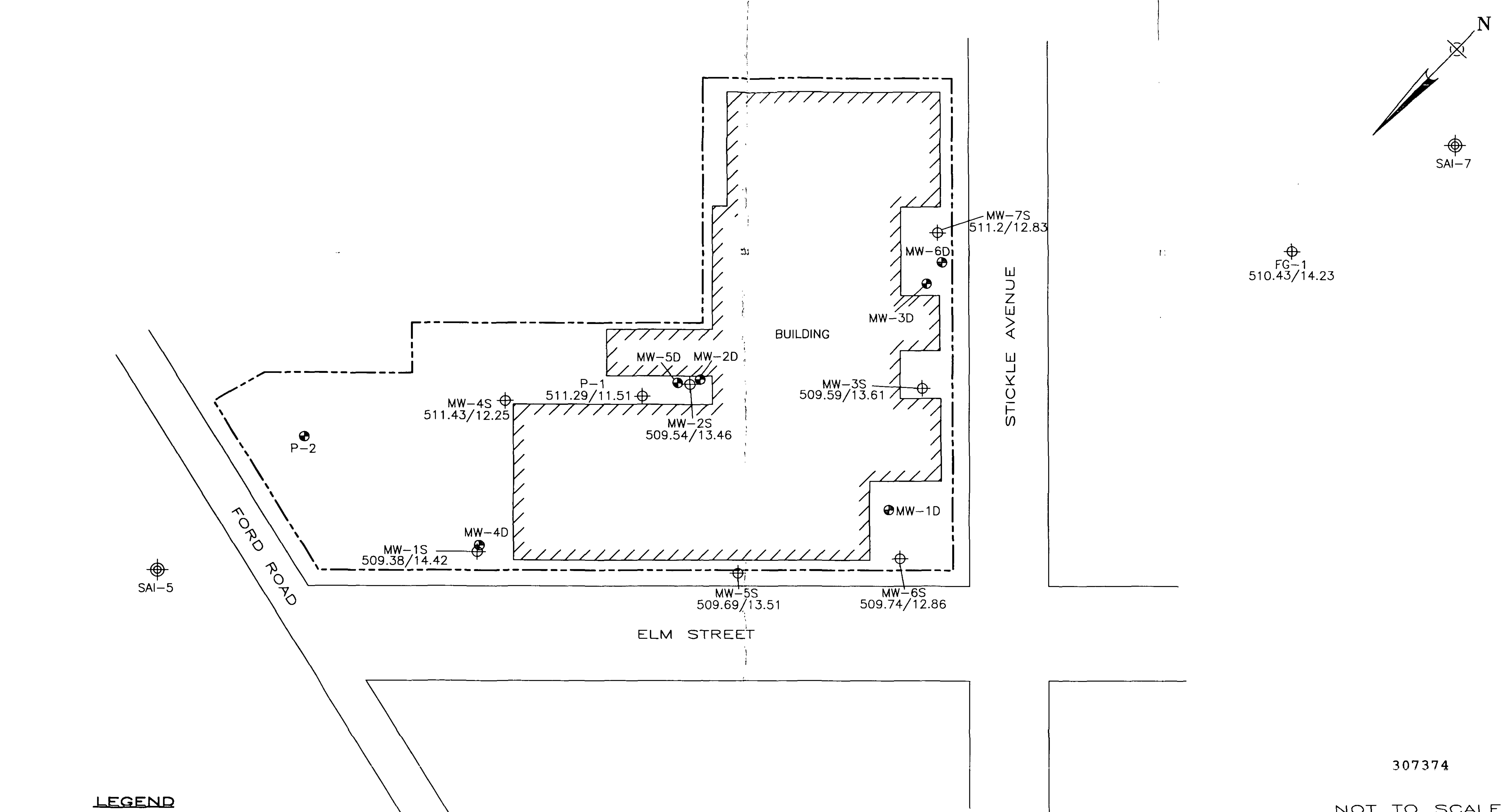
Monitoring Well	Top of Casing (feet, MSL)	Ground Surface Elevation (feet, MSL)	10/4/89		9/11/90-9/14/90		9/24/90-9/27/90		10/8/90		10/9/90		10/10/90		11/16/90		12/20/90		1/16/91		Range (feet)	Fluctuation (feet)
			Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)	Water Table Elevation (feet, MSL)	Depth Below Grade (feet)		
MW-1S	524.09	524.48	511.59	12.89	511.79	12.69	-	-	510.77	13.71	510.74	13.74	510.71	13.77	510.69	13.79	511.23	13.25	511.59	12.89	12.69-13.79	1.10
MW-2S	525.97	523.81	512.57	11.24	511.77	12.04	-	-	511.42	12.39	511.39	12.42	511.37	12.44	511.29	12.52	511.47	12.34	511.82	10.99	10.99-12.52	1.53
MW-3S	525.39	523.94	512.01	11.93	510.99	12.95	-	-	511.46	12.48	511.41	12.53	511.40	12.54	511.30	12.64	511.51	12.43	511.83	12.11	11.93-12.95	1.02
MW-4S	523.31	523.68	-	-	511.81	11.87	-	-	511.43	12.25	511.69	11.99	511.85	11.83	511.43	12.25	511.93	11.75	512.53	11.15	11.15-12.25	1.10
MW-5S	523.38	523.87	-	-	511.96	11.91	-	-	511.40	12.47	511.40	12.47	511.37	12.50	511.29	12.58	511.51	12.36	511.86	12.01	11.91-12.58	0.67
MW-6S	522.99	523.26	-	-	511.99	11.27	-	-	511.40	11.86	511.37	11.89	511.36	11.90	511.29	11.97	511.52	11.74	511.84	11.42	11.27-11.97	0.70
MW-7S	523.56	524.05	-	-	511.86	12.19	-	-	511.37	12.68	511.34	12.71	511.32	12.73	511.22	12.83	511.43	12.62	511.77	12.58	12.19-12.83	0.64
FG-1	524.04	524.66	-	-	-	-	510.84	13.82	510.62	14.04	510.58	14.08	510.56	14.10	510.43	14.23	510.73	13.93	511.09	13.57	13.57-14.23	0.66

Key

MSL - Mean Sea Level

*Information from August 1991 Feasibility Study, Rockaway Borough Well Field Site, Tables 1-1 and 1-2 by ICF Technology Incorporated

Note: Monitoring well FG-1 is located on the Building 13 property. All other wells listed are located on the Building 12 property.



307374

NOT TO SCALE

LEGEND

- PROPERTY BOUNDARY
- MW-1S — SHALLOW MONITORING WELL LOCATION
- MW-4D — DEEP MONITORING WELL LOCATION
- SAI-5 — STATE WELL LOCATION
- 509.74/12.86 — GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL/ DEPTH TO GROUNDWATER FROM GRADE IN FEET-LOWEST ELEVATION/DEPTH ON OR BEFORE JANUARY 16, 1991

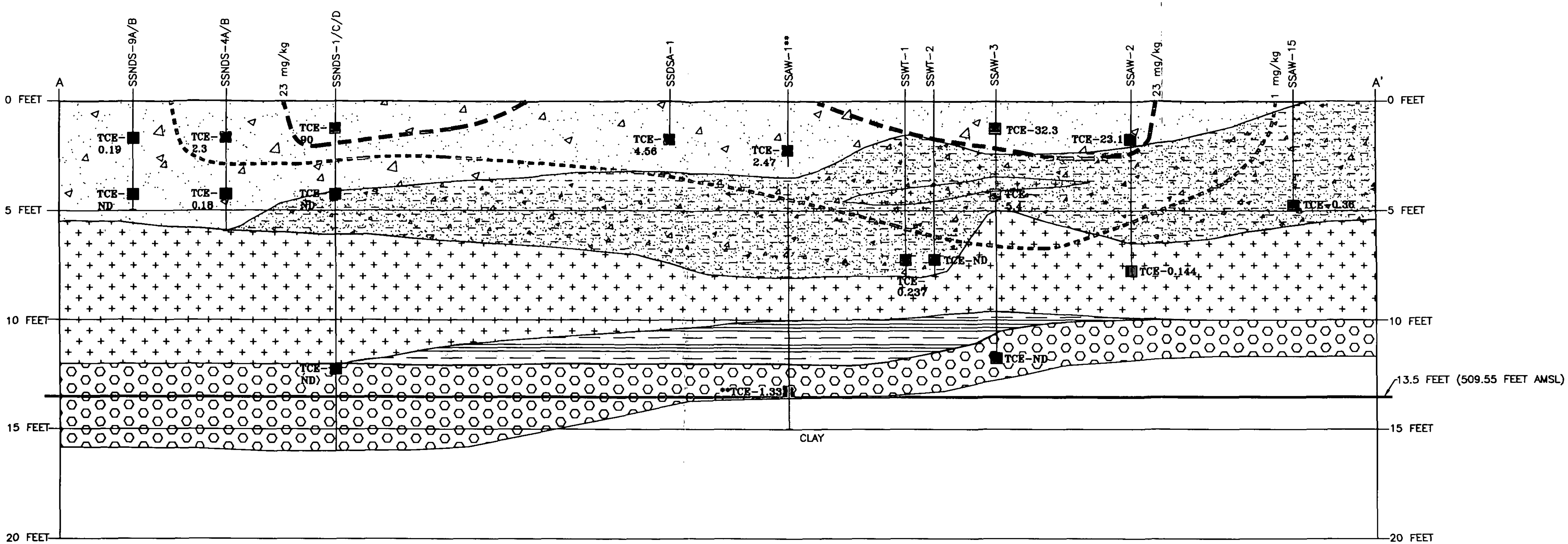
NOTES:
1) SITE MAP BASED ON PLAN BY FIRST ENVIRONMENT.
2) GROUNDWATER ELEVATIONS FOR MW-1S, MW-2S, MW-3S, MW-5S, AND MW-6S COLLECTED ON DECEMBER 14, 1988.
3) GROUNDWATER ELEVATIONS FOR MW-4S, MW-7S, FG-1, AND P-1 COLLECTED ON NOVEMBER 16, 1990.

THE WHITMAN CompanieS, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH
MORRIS COUNTY, NEW JERSEY

LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE 1/16/91

ORIGINAL BY: E.C.	DRAWN BY: R.R.	DRAWING NO: 950302G1
CHECKED BY: E.C.	DATE: OCTOBER 2005	FIGURE NO: A1



LEGEND

SSAW-3 TCE-32.3 – SOIL SAMPLE LOCATION WITH RESULTS IN mg/kg

TCE – TRICHLOROETHYLENE

ND – NOT DETECTED

TCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

TCE 23 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

** – THE TCE RESULT FOR SAMPLE SSAW-1 WAS NOT USED IN THE PREPERATION OF THE ISOCONCENTRATION LINES. IT IS JUST ABOVE THE NEW JERSEY IMPACT TO GROUNDWATER SOIL CLEANUP CRITERIA OF 1 mg/kg AND MAY BE THE RESULT OF CONTAMINANT DIFFUSION FROM THE GROUNDWATER TO THE SOIL AT TEHE CAPILLARY ZONE.

– SILTY SAND AND GRAVEL

– SILTY FINE SAND

– SILTY CLAY WITH SAND AND SOME GRAVEL

– SILTY CLAY WITH SAND

– GRAVEL

AMSL – ABOVE MEAN SEA LEVEL

– LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE JANUARY 16, 1991

NOTE: SEE FIGURE 3 FOR CROSS SECTION LOCATION

0 20'
HORIZONTAL SCALE

0 5'
VERTICAL SCALE

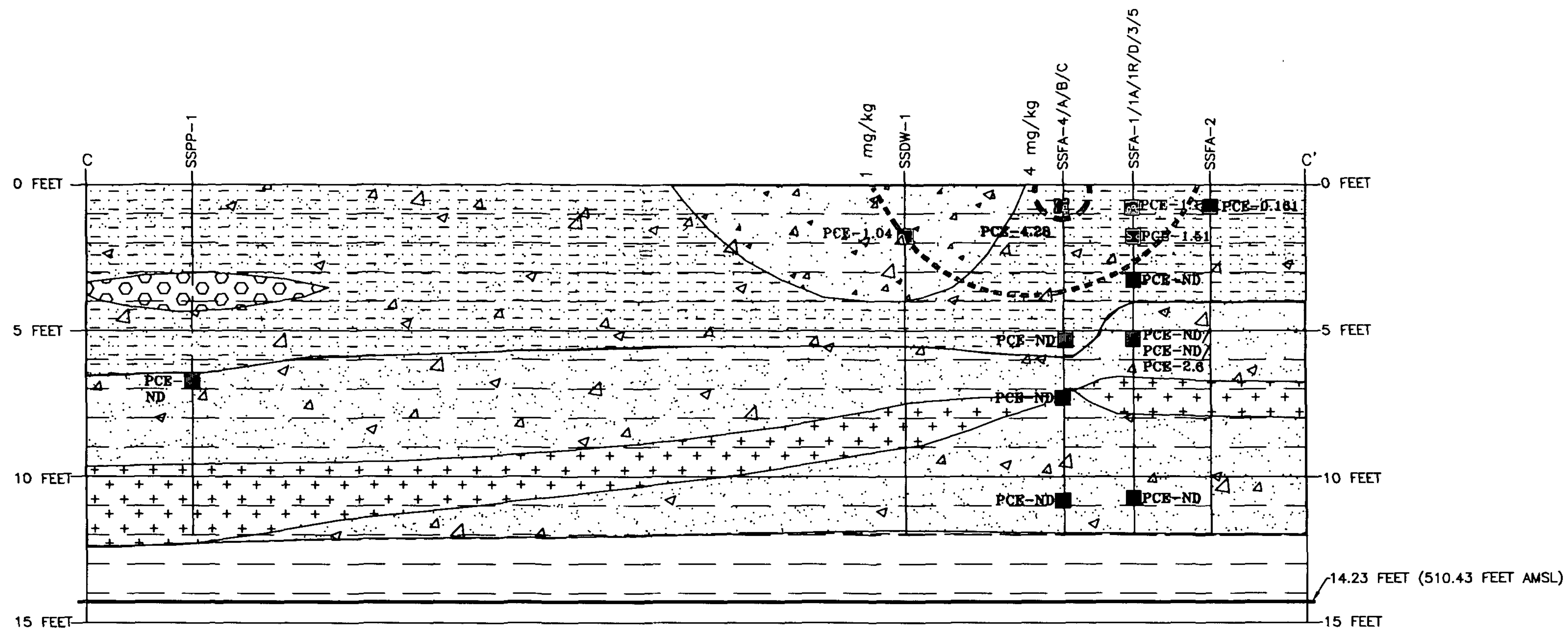
307375

THE WHITMAN CompanieS, INC.

KLOCKNER & KLOCKNER PROPERTY
ROCKAWAY BOROUGH
MORRIS COUNTY, NEW JERSEY

CROSS-SECTION OF LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE 1/16/91
BUILDING 12

ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302G3
CHECKED BY: M.M.	DATE: OCTOBER 2005	FIGURE NO: A2



LEGEND

SSFA-2 PCE-0.161 – SOIL SAMPLE LOCATION WITH RESULTS IN mg/kg

PCE – TETRACHLOROETHYLENE

ND – NOT DETECTED

PCE 1 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE 4 mg/kg – ISOCONCENTRATION LINE (ESTIMATED)

PCE-4.28 – PCE CONCENTRATION AT OR ABOVE 4 mg/kg

PCE-1.51 – PCE CONCENTRATION ABOVE 1 mg/kg

– SILTY SAND AND GRAVEL

– SILTY FINE SAND

– SILTY CLAY WITH SAND AND SOME GRAVEL

– GRAVEL

AMSL – ABOVE MEAN SEA LEVEL

– LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE JANUARY 16, 1991

NOTE: SEE FIGURE 7 FOR CROSS SECTION LOCATION

0 20'
HORIZONTAL SCALE

307376

0 5'
VERTICAL SCALE

THE WHITMAN CompanieS, INC.	KLOCKNER & KLOCKNER PROPERTY ROCKAWAY BOROUGH MORRIS COUNTY, NEW JERSEY	
	CROSS-SECTION OF LOWEST DEPTH TO GROUNDWATER MEASURED ON OR BEFORE 1/16/91 BUILDING 13	
ORIGINAL BY: M.M.	DRAWN BY: R.R.	DRAWING NO: 950302G2
CHECKED BY: M.M.	DATE: OCTOBER 2005	FIGURE NO: A3